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EDITORIAL

There has been in the past two or three years an unprecedented increase in the number of graduates of this College who are assigned for work in the provinces in such capacities as agricultural inspectors, agricultural assistants, deputy provincial governors, farm advisers, and other duties which bring them in a more or less direct relation to the people. These graduates had a thoroughly practical, as well as technical, previous training in the College, and we do not in the least doubt that they can all be depended upon to accomplish what can reasonably be expected of them in the way of promoting agricultural development in the provinces to which they may be assigned.

There are, however, several important considerations which directly bear on their success in discharging these important obligations, and we hope that every one of our alumni will do all in his power to minimize every possible source of failure and uphold by the most brilliant possible showing the good name of his Alma Mater.

A new agricultural graduate, fresh as he is from college, on being assigned to provincial service, is usually left at once to his own resources and made to do work which more properly should be done under experienced supervision; and this supervision is not easily obtained because of the shortage of this class of personnel. Inexperienced in dealing with the people and in solving the various agricultural problems which he may meet from time to time, as is true with new graduates from any other agricultural college, and practically alone and unguided, we are, indeed, surprised that they do not commit more blunders. But these shortcomings should not be a source of discouragement; on the contrary, fail-

ures should act as a spur toward greater achievement. And public opinion should not be too rash in its assumption of a condemnatory attitude, for it should take into consideration the many adverse circumstances to which these new government agricultural agents are often subjected.

In general, the first and most important step which the agricultural officials should take on arriving at a new station is to become acquainted with the people and their needs; and attempt to acquire first-hand information by actual investigation of conditions in the locality. He should, as early as this can be done, approach the "principales" of the place and attempt to win them to his side; as this class of people, through their influence in the community will be of great help in furthering the work.

In giving advice to the people one cannot be too careful; the farmers should not be made to try experiments that have not been performed and positively proven to be a success under the local conditions. The failure of a single crop, or the death of a single animal, which follows advice of the agricultural official may be sufficient to offset the best efforts in the province for many years.

The most practical way of convincing the people that certain methods are an improvement and more conducive to greater production than those in general practice in the provinces is to get them to see the results by actual demonstration. It will be possible to drive the argument home to the farmers much more effectively in this manner than by a whole series of oratorical efforts. If the Bureau does not provide sufficient funds for demonstration purposes, land, plants and labor can be obtained at practically no expense on the part of the Government by cooperative work with the farmers, which can be built up without difficulty.

Another important consideration which the agricultural graduate should not overlook is the fact that he owes it to himself and to the profession that he embraced always to keep himself abreast with the progress of agricultural science. He should always be on the alert for knowledge pertaining to his work, and the fact must not be lost sight of that student life does not cease with graduation from college. He should be reading good books, a comprehensive list of which, together with some excellent suggestions for proper reading, was published in an earlier issue of this paper. He should keep himself constantly informed of reports on agricultural investigations, especially pertaining to tropical farming. Even at the risk of being accused of mercenary motives, we would advise our graduates that it will be to their very great advantage to be subscribers to the *Philippine Agriculturist* and keep themselves up-to-date at least as to its contents.

The College of Agriculture, with its body of specialists in the Faculty, has always been but too glad to help our graduates in every possible way. If they have any specific problem that they can not solve for themselves, they should not hesitate to inform the College of their troubles, and they will always be sure of a hearty response.

A Study of the Relation of Climatic Conditions to the Vegetative Growth and Seed Production of Rice[1]

By Fernando de Peralta y Leaño

INTRODUCTION

Experiments on rice, performed both in the Philippines and in other rice-growing countries, have been carried on without reference to the conditions, usually termed climatic, which surround the plants. The climate is undoubtedly an important consideration in the profitable production of rice, and it is to be regretted that no carefully planned studies have been published along this line. It was the object of this work to study the relations of climatic conditions and also water temperature conditions on the growth and seed production of lowland rice. The methods employed were especially planned to bring out, as far as possible, correlations between the plant processes of vegetative growth and seed production and the climatic conditions.

Plots of lowland rice were started every four weeks during a period of one year from April, 1916, to April, 1917, and observations on climatic conditions and water conditions and on the growth and seed production of the plants were made regularly throughout the period of study. The methods employed in cultivating the plants were similar to those commonly employed in this locality.

EXPERIMENT AND RESULTS

Seeds and Seedlings

Seed Bed

On April 2, 1916, a place near the water reservoir west of the Main Building was selected for a seed bed. Six months before, the Agronomy I students of 1915-1916 had used this land for a seed bed. The soil is clay loam. A plot 6 by 5 meters was laid out. This was then divided into thirteen equal plots and a ditch was made around each. The purposes of the ditch were: (1) to conduct the water into the plot and (2) to prevent animals from eating the newly sown seeds.

Each plot was forked a week before the seeds were planted. On the day of sowing each plot was fertilized and the soil prepared in the usual way. Herbaceous compost was used as a fertilizer, the amount being two wheelbarrow loads for each plot. The compost was spread uniformly on the surface and then forked in and mixed completely with the soil. The soil was thoroughly pulverized with a rake.

The plots were planted at intervals of four weeks and the seedlings were allowed to remain in each plot for six weeks.

VARIETY OF RICE USED

For this experiment Inintiw rice seed taken from the harvest of Cornelio Balangue was used. This variety can be grown either as upland rice or lowland rice.

Inintiw variety has long been grown in the barrio of Maajas, near Los Baños, as upland rice. Crisóstomo introduced it in the College in 1914, where it was grown as an upland rice and where it gave a yield of 53.2 cavanes of unhulled rice per hectare. The length of time from sowing to harvest was 104 days.

Arsenio A. Goco (1) grew Inintiw as upland rice in 1916. He planted it in drills 50 x 10 centimeters and got an average yield of 58.79 cavanes of unhulled rice per hectare. It matured in 121 days. This is longer than the length of time required for maturity, as found by Crisóstomo. It seems to the writer that this is probably due to the fact that Goco sowed the rice in drills and the plants had more space for development.

According to the control plot of Balangue this variety gave a yield of 2,540 kilograms (2), or 58 cavanes to the hectare. It was planted one kilometer east

1 Thesis presented for graduation from the College of Agriculture, No. 10[illegible]

of the College farm. The soil is sandy and clay loam. The seeds were broadcasted at the rate of one cavan per hectare on June 7, 1915, and harvested October 5, 1915, or 120 days from sowing to maturity. During the same year this variety was grown as upland rice on a farm southwest of the College farm. The soil is sandy and clay loam. The seeds were broadcasted at the rate of $1\frac{1}{5}$ cavanes per hectare on June 24, 1915, and harvested October 13, 1915, or 111 days from sowing to maturity. In his check plot, Balangue (3) obtained a yield of 3,179 kilograms per hectare, or 72.6 cavanes of unhulled rice.

A description of this variety is as follows: "It is 141.3 cm. high with 3.2 bearing culms with 5.7 nodes; the leaf is catchy, 62 cm. long and 1.15 cm. wide. The panicle is closed with few grains. The grain is catchy, light orange-yellow 7.8 cm. long and 3. 23 cm. wide." (4)

METHOD OF SOWING

Small furrows were made in the land prepared for a seed bed. The seeds were spread in the furrows and covered with soil by hand. After sowing, the water was turned into the ditch until the soil was nearly saturated. The bed was watered twice a week till the seedlings were transplanted to the field. This method was followed for all of the plantings.

MEASUREMENTS AND RESULTS

Growth Rates in Seed Bed

Measurements of the growth of seedlings were made as soon as the seeds germinated. These were made to determine the vigor of the seedlings in the seed bed. Ten seedlings were measured. These plants were not selected for vigor but were picked according to their location in the bed so that they represented a fair average of the whole seed bed. Beside each of the ten plants a small peg was placed which served as a base mark for height measurement. The seedlings were measured once a week until they were transplanted to the paddy.

The dates on which the seeds were sown, and the height of the plants each week until they were transplanted are shown in Table I.

TABLE I

1. Cultures	1	2	3	4	5	6	7	8	9	10	11	12	13	13'
2. Date of sowing	4–14–16	5–12–16	6–9–16	7–7–16	8–4–16	9–1–16	9–29–16	10–27–16	11–10–16	12–22–16	1–19–17	2–16–17	3–16–17	3–16–17
3. Number of plants measured	10	10	10	10	10	10	10	10	10	10	10	10	10	10
4. First measurement date	4–20–16	5–17–16	6–15–16	7–13–16	8–10–16	9–7–16	10–6–16	11–3–16	12–18–16	12–31–16	1–28–17	2–25–17	3–26–17	3–26–17
5. Average height to top of leaves	2.7 cm.	2.8	4.5	3.6	3.3	3.4	2.6	3.9	6.5	4.9	5.1	4.7	5.6	7.3
6. Second measurement date	4–27–16	5–24–16	6–22–16	7–20–16	8–17–16	9–14–16	10–13–16	11–10–16	12–25–16	1–7–17	2–4–17	3–4–17	4–2–17	4–2–17
7. Average height to top of leaves	15.8 cm	19.3	12.2	13.4	11.8	12.4	14.3	14.8	18.7	13.1	12.6	12.0	14.2	14.6
8. Third measurement date	5–4–16	5–31–16	6–29–16	7–27–16	8–24–16	9–21–16	10–20–16	11–17–16	1– 6–17	1–14–17	2–11–17	3–11–17	4–9–17	4–9–17
9. Average height to top of leaves	26.0 cm.	30.1	17.6	10.3	16.4	18.0	18.6	26.3	23.1	16.7	20.1	15.6	14.5	19.0
10. Fourth measurement date	5–11–16	6–7–16	7–6–16	8–3–16	8–31–16	9–28–16	10–27–16	11–24–16	1–13–17	1–21–17	2–18–17	3–18–17	3–16–17	4–16–17
11. Average height to top of leaves	34.5 cm.	35.7	25.2	28.2	23.6	20.6	27.4	29.3	26.4	21.1	22.8	20.2	25.3	28.0
12. Fifth measurement date	5–18–16	6–14–16	7–13–16	8–10–16	9–7–16	10–5–16	11–3–16	12–.1–16	– –	1–28–17	2–25–17	3–25–17	4–23–17	4–23–17
13. Average height to top of leaves	42.8 cm.	39.6	30.1	33.2	28.5	24.5	31.5	34.3	– –	23.5	24.7	21.5	30.6	29.7
14. Sixth measurement date	5–25–16	6–21–16	7–20–16	8–17–16	9–14–16	10–12–16	11–10–16	12–8–16	– –	2–2–17	3–2–17	– –	– –	– –
15. Average height to top of leaves	49.3 cm.	46.2	36.3	36.9	32.1	27.3	32.5	38.5	– –	25.8	27.4	– –	– –	– –
16. Average height to top of leaves	49.3 cm.	46.2	36.3	36.9	32.1	27.3	32.5	38.5	26.4	25.8	27.4	21.5	30.6	29.7
18. Height increase the week before transplanting	6.5 cm.	6.6	6.2	3.7	10.6	2.8	1.0	4.2	3.3	2.3	2.7	1.3	5.3	1.7

TABLE II

DAILY GROWTH RATE OF RICE IN SEED BED.

Culture Number	1	2	3	4	5	6	7	8	9	10	11	12	13	13'
	(6)	(5)	(6)	(6)	(6)	(6)	(7)	(7)	(8)	(9)	(9)	(9)	(10)	(10)
First week (a)	.45	.56	.75	.60	.55	.56	.37	.55	.81	.54	.56	.52	.56	.73
Second week	1.87	2.50	1.10	1.41	1.21	1.28	1.67	1.55	1.74	1.17	1.07	1.04	1.22	1.04
Third week	1.45	1.54	.77	.84	.65	.80	.61	1.50	.62	.51	1.07	.51	.04	.62
Fourth week	1.21	.80	.51	1.27	1.02	.37	1.25	.42	.47	.62	.38	.65	1.54	1.28
Fifth week	1.18	.55	.70	.71	.70	.55	.58	.71		.34	.27	.18	.75	.24
Sixth week (a')	.92	.94	88	.52	.51	.54	.14	.61		.46	.54			
										(5)	(5)			

(a) The figures in parantheses are the number of days from the date of sowing to first measurement.
(a') The figures show the number of days between the 5th and 6th measurements.

TABLE III.

COMPARISON OF GROWTH OF RICE BEFORE AND AFTER TRANSPLANTING.

Culture Number	1	2	3	4	5	6	7	8	9	10	11	12	13	13'
(1) Height increase the week before transplanting (see Table I, line 17)	6.5	6.6	6.2	3.7	10.6	2.8	1.0	4.2	3.3	2.3	2.7	1.3	5.3	1.7
(2) Increase leaf area the week after transplanting (see Table IV second measurement)	sq. cm. 22.5	18.7	—	32.0	41.7	3.7	18.9	25.3	7.2	6.8	.2	9.2	4.7	—2.2
(3) Total Height at transplanting (see Table line 16) in cm	49.3	46.2	46.3	36.9	32.1	27.3	32.5	38.5	26.4	25.8	27.4	21.5	30.6	29.7
(4) Deviation: $\frac{C-A}{R} \times 100$ (a)	+24.4	+25.4	+21.3	—4.8	+17.1	—14.2	—32.9	+.42	—8.96	—19.4	—1.51	—29.4	—11.9	—25.6
(5) Deviation: $\frac{C'-A'}{R'} \times 100$ (b)	+18.2	+9.5	—	+17.2	+52.1	—24.9	+9.9	+24.5	—16.7	—17.6	—32.6	—12.1	—22.3	—38.1
(6) Deviation of total height in per cent calculated in the same manner as lines (4) and (5)	+56.1	+45.1	+45.4	+11.6	—5.7	—22.9	—4.2	+17.3	—26.2	—28.3	—22.5	—43.8	—7.5	—14.3

N. B.—(a) A = average height growth of all cultures during the last week in seed bed.
C = average height growth of plants in the individual cultures.
R = extreme difference of height growth between highest and lowest values.
(b) A' = average of increase in leaf product of all cultures during the first week after transplanting.
C' = average of increase in leaf product of all plants in the individual cultures.
R' = extreme difference of increase in leaf areas between highest and lowest values for the cultures.

From the data of Table I calculations were made of the mean daily growth rates for each week that the plants were in the seed bed. These are shown in Table II and also as graphs in Plate I. Each of the cultures is represented by a separate graph. These figures are expressed in daily growth rate of rice in seed bed. The ordinates represent the age in number of days after planting and the abscissas represent the daily growth rate which is expressed in centimeters.

From the 14 graphs it appears that the growth rate is regular except 13 and 13'. It is also evident that the maximum daily growth rate occurred the week following the first measurement. After this week there was a gradual decrease of growth rate.

Comparison between growth rates before and after transplanting.—Line 16 in Table I shows the height of the seedlings when they were transplanted into the paddy. To show the effect of the size of the seedling upon recovery after transplanting, the writer found the deviation of each culture from the average in its growth rate during the last week in seed bed (line 4, Table III), in its increase in leaf area during the first week after transplanting (line 5, Table III) and in the total height of the plants before transplanting. Each of the figures in Table III, lines 4, 5 and 6, is expressed in per cent of the extreme range of values between the highest and the lowest, thus the value in line 4 for culture 1 is obtained as follows:

A—Average height increase of all cultures=4.16 cm.

C—Height increase of culture 1=6.5 cm.

R—Extreme difference between greatest and smallest increase in height=9.6 cm.

$$\text{Then: } \frac{6.5-4.16}{9.6}\times 100 = +24.4\%$$

In the above lines it is to be noted that plus (+) or minus (—) signs are placed before each of the figures. The plus signs before the figures indicate that these figures are higher than that figure which represents the average growth and, therefore, these figures are better than those with minus signs before them.

Comparing line 3, total height at transplanting, and line 5, deviation increase first week after transplanting, it can be seen that the taller seedlings recovered better than the shorter ones. Plants with height between 49.3 centimeters and 32.5 centimeters at transplanting recovered better after transplanting than the plants with height between 30.6 centimeters and 21.5 centimeters.

Line 3 also shows that in cultures 9 to 13 the total heights are shorter than the total heights of the cultures from 1 to 8. Further, if the corresponding leaf products the first week after transplanting are expressed in per cent, the respective figures representing the values of the deviation of increase have all minus signs in cultures from 9 to 13, while cultures 1 to 8, with the exception of culture 6 have all plus signs. The most probable cause of this decline in height growth was a lowering of the vitality of the seeds. cultures 1 to 13 were all grown from seed from the same harvest. The per cent of germination from the first culture to the thirteenth lowered gradually from 93 per cent to 75 per cent. The time covered by all of the successive plantings of cultures 1 to 13 was one year.

PERIOD OF VEGETATIVE GROWTH

Paddy-field

A plot, 29 meters by 13.5 meters east of the Auditorium of the College of Agriculture, was selected as a paddy-field. The soil was clay loam. The land was plowed and leveled. Then a dike

30 centimeters high was constructed around the whole area. The paddy-field was again plowed and leveled after the construction of the dike. During the preparation of the land water was turned in through the water gauge and the amount of water was recorded. When each lot of seedlings was transplanted, there was standing water 10 centimeters deep in the paddy-field.

After the rice-field was well prepared, it was divided into eighteen plots, each 4.5 meters square. Twelve of these plots were used for successive plantings of Inintiw variety and the remaining six were used for successive plantings of Binangbang variety. This paper will deal only with the results secured from Inintiw. For the thirteenth planting of Inintiw Plot 2 was used. In this plot Binangbang had been previously planted. At the same time that the thirteenth culture of Inintiw was planted, all the remaining plots, except 11 and 12, were replanted with new seed of Inintiw which had been raised in Plot 2. Plots 11 and 12 were not replanted for the plants in these plots had not been harvested. The object of replanting all the plots at the same time was to test the uniformity of the fertility of the soil and the data thus obtained were used as a check of the yield of the former cultures planted in the same plots.

Transplanting to Paddy-field

Seedlings of uniform size and with the same number of leaves were selected. The seedlings were planted one in each hill and the hills were 30 centimeters apart each way. For every planting two hundred and twenty-five seedlings were planted in each culture. All of the seedlings, except in the seventh culture, were six weeks old when they were transplanted. Those in the seventh culture were only four weeks old at transplanting. This was due to the failure of the first seed sown.

Water reservoir

There was always standing water in the paddy-field until all the cultures were harvested.

Plate II, page 181, shows the location of the instruments used and the plots in the paddy.

At first the porous cups were placed side by side in "a" as indicated in the map, Plate II. They were transferred to "a^1" on August 18, 1916, the day when culture 4 of Inintiw was transplanted. Growth measurements in culture 1 of Inintiw had been completed a week before this day. The porous cups were transferred to "a^2" on December 8, 1916, when culture 8 of Inintiw was transplanted. Finally they were moved to "a^3" at the transplanting of culture 11. This was on March 2, 1917. The object of transferring the porous cups was to have them close to the culture which was newly transplanted.

Measurements and Results

Five representative plants were measured weekly in each of the cultures. In each culture there were one hundred plants which were located in the ten inner rows. They were harvested and recorded including the five plants measured, and the outer three rows surrounding these were used as border lines. The one hundred plants represented a perfect square. The plants at the four corners of the square and the plants nearest to the intersection of the diagonals of the square were chosen for measurement to represent the culture. This method of determining the plants to be measured was followed in every culture grown. The representative plants were measured the day following the date of transplanting and from that time measurements were taken weekly until the panicles were well exposed. All the leaves produced by the representative sample plants were measured; the length and width, and the total height from the tip of panicles to root system were recorded. The total height was used to indicate the general vigor of the culture, and the leaf measurements were used for the computation of leaf area. The total leaf area is the best measure of the size of such plants as rice, which have their stems covered by overlapping leaf bases. Determinations of actual leaf areas have not been made, but the leaf product has been employed. This is an index obtained by multiplying the length of the leaf by its width; it represents approximately the leaf area.

TABLE IV.

GROWTH IN AREA OF LEAVES OF RICE, ININTIW VARIETY, MAY, 1916, to SEPTEMBER, 1917

Culture No.	Date Planted 1916	Date Transplanted 1916	First Meas't Date 1916	First Meas't Leaf Product	Second Meas't Date 1916	Second Meas't Leaf Product	Second Meas't Increase	Third Meas't Date 1916	Third Meas't Leaf Product	Third Meas't Increase	Fourth Meas't Date 1916	Fourth Meas't Leaf Product	Fourth Meas't Increase	Fifth Meas't Date 1916	Fifth Meas't Leaf Product	Fifth Meas't Increase	Sixth Meas't Date 1916	Sixth Meas't Leaf Product	Sixth Meas't Increase	Seventh Meas't Date 1916	Seventh Meas't Leaf Product	Seventh Meas't Increase	Eighth Meas't Date 1916	Eighth Meas't Leaf Product	Eighth Meas't Increase
				sq.cm.		sq.cm.	sq.cm.		sq.cm.	sq.cm.		sq.cm.	sq.cm		sq.cm	sq.cm		sq.cm	sq.cm		sq.cm	sq.cm		sq.cm	sq.cm	
1	4–14	5–26	5–27	61.1	6–3	83.6	22.5	6–10	142.7	59.1	6–17	250.1	107.4	6–24	433.8	183.7	7–1	677.9	244.1	7–8	1210.9	433.0	7–15	1931.5	720.6
2	5–12	6–23	6–24	40.4	7–1	59.1	18.7	7–8	98.2	39.1	7–15	320.4	222.2	7–22	889.3	568.9	7–29	1022.7	133.4	8–15	2161.4	1138.7	8–12	2589.5	42.1
3	6–9	7–21	—	—	7–29	74.2		8–5	182.7	108.5	8–12	368.4	185.7	8–19	762.9	394.5	8–26	1393.5	630.6	9–2	1978.8	585.3	9–9	2111.8	133.0
4	7–7	8–18	8–19	33.0	8–26	65.0	32.0	9–2	91.0	26.0	9–9	126.0	35.0	9–16	305.8	179.8	9–23	722.2	416.4	9–30	815.9	93.7	10–7	801.6	14.3
5	8–4	9–15	9–16	42.9	9–23	84.6	41.7	9–30	99.7	15.1	10–7	142.1	42.4	10–14	244.9	102.8	10–21	362.3	117.4	10–28	361.5	0.8			
6	9–1	10–13	10–14	24.7	10–21	28.4	3.7	10–28	35.4	7.0	11–4	88.9	53.5	11–11	182.0	93.1	11–18	348.9	166.9	11–25	271.4	77.5			
7	9–27	11–10	11–11	33.1	11–18	52.0	18.9	11–25	75.3	23.3	12–3	150.6	75.3	12–9	244.5	93.9	12–16	227.6	16.9	12–23	214.6	13.0	19–17		
8	10–27	12–8	12–9	40.1	12–16	65.4	25.3	12–23	99.2	33.8	12–30	158.4	59.2	1–6–17	176.3	17.9	1–3–17	297.3	121.0	1–20	276.2	21.1	1–27	243.6	32.6
9	12–10	1–5–17	1–6–17	10.5	1–13	17.7	7.2	1–20	33.4	15.7	1–27	61.4	28.0	2–3	201.1	139.7	2–10	380.2	179.1	2–17	804.3	424.1	2–24	779.9	24.4
10	12–22	2–2	2–3	23.7	2–10	30.5	6.8	2–17	57.5	27.0	2–24	106.1	48.6	3–3	226.0	119.9	3–10	389.4	163.4	3–17	421.8	32.4			
11	1–19–17	3–2	3–3	36.7	3–10	36.9	0.2	3–17	89.0	52.1	3–24	217.8	128.8	3–31	421.9	204.1	4–7	657.9	236.0	4–14	687.9	30.0			
12	2–16	3–30	3–31	31.5	4–7	40.7	9.2	4–14	95.5	54.8	4–21	261.7	166.2	4–28	438.8	177.1	5–5	846.0	407.2	5–12	1007.6	161.6	5–19	1262.4	254.8
13	3–16	4–27	4–28	19.6	25–5	24.3	4.7	5–12	35.2	10.9	5–19	67.8	32.6	5–26	176.2	108.4	6–2	330.4	154.4	6–9	559.7	229.1	6–16	812.7	253.0
13[1]	3–16	4–27	4–28	8.5	5–5	6.3	2.2	5–12	13.0	6.7	5–19	33.5	20.5	5–26	49.4	15.9	6–2	154.7	105.3	6–9	307.0	152.3	6–16	337.3	30.3
Average				31.2		47.8	10.7		81.9	34.2		168.0	86.1		339.4	171.4		557.9	218.5		792.0	226.2		1207.8	194.2

TABLE IV—Continued.

Culture No.	Ninth Meas't Date 1916	Ninth Meas't Leaf Product	Ninth Meas't Increase	Tenth Meas't Date 1916	Tenth Meas't Leaf Product	Tenth Meas't Increase	Eleventh Meas't Date 1916	Eleventh Meas't Leaf Product	Eleventh Meas't Increase	Twelfth Meas't Date 1916	Twelfth Meas't Leaf Product	Twelfth Meas't Increase	Thirteenth Meas't Date 1916	Thirteenth Meas't Leaf Product	Thirteenth Meas't Increase	Fourteenth Meas't Date 1916	Fourteenth Meas't Leaf Product	Fourteenth Meas't Increase	Fifteenth Meas't Date 1916	Fifteenth Meas't Leaf Product	Fifteenth Meas't Increase
		sq.cm	sq.cm		sq.cm	sq.cm.		sq.cm.	sq.cm.		sq. cm	sq.cm		sq. cm	sq. cm.		sq.cm.	sq.cm.		sq.cm.	sq.cm.
1	7–22	2328.8	397.3	7–29	3151.8	823.0	8–5	5072.6	1920.8	8–12	3254.9	1817.7									
2	8–19	2479.7	109.8	8–26	2436.5	43.2					—	—	—	—	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
6	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
7	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
8	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
9	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
10	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
11	1917			1917			1917				—	—	—	—	—	—	—	—		—	—
12	5–26	1261.4	1.0	6–2	1333.5	72.1	6–9	1125.5	208.0	1917			1917			1917			1917		
13	6–23	1105.9	293.2	6–30	1006.4	899.5	7–7	1109.1	102.7	7–14	1250.1	141.0	7–21	1084.0	166.1	7–28	1290.4	206.4	8–4	1143.3	147.1
13[1]	6–23	971.9	634.6	6–30	1114.6	142.7	7–7	1371.9	257.3	7–14	1577.0	205.1	7–21	1653.8	76.8	7–28	1733.4	79.6	8.4	1536.7	196 .7
Average		1609.5	242.8		1806.5	21.0		2144.7	338.2		6082.7	490.5		1388.9	44.6		1511.9	143.0		1340.0	171.6

Table IV shows the culture numbers, the dates of sowing and transplanting, and the weekly determinations of mean total leaf-products per plant together with the increases in the leaf-product values.

The length of the vegetative growth period (from the time of transplanting to the time when the whole panicle was exposed) may also be seen from this table, since the measurements were begun one day after transplanting and were discontinued when the panicles were exposed. The data for the mean total leaf-products per plant for each culture are plotted as graphs in Plate III, page 182.

ENVIRONMENTAL CONDITIONS

Water Supply

General.—The water delivered into the paddy was measured in liters. The rate of flow had been tested and found to be 60 liters per minute through an opening of one centimeter at the orifice of a water gauge.

Table V shows the period during which the water was allowed to flow in and the amount of water drawn out. The paddy was 29 meters by 13.5 meters, and these dimensions, with the average depth of water, were used to compute the volume of water withdrawn. From Table V it will be noted that the number of hours during which the water was allowed to pass into the paddy-field is very irregular. There is no definite number of hours during which the water was allowed to go in. This irregularity was due to the fact that during rainy periods irrigation was unnecessary.

TABLE V.

WATER SUPPLIED TO THE PADDY.

Water supplied		Water drawn out	
Date	No. of hours allowed to flow	Date	cu. m. volume.
5–26–16 to 5–27–16	36		
5–27–16 " 6–3–16	144		
6– 3–16 " 6–10–16	95		
6–10–16 " 6–17–16	62	Depth	.04m
6–17–16 " 6–24–16	87	6–22–16	15.66
6–24–16 " 7– 1–16	74		
7– 1–16 " 7– 8–16	59		
7– 8–16 " 7–15–16	66	Depth	.03m
7–15–16 " 7–22–16	59	7–20–16	11.75
7–22–16 " 7–29–16	77		
7–29–16 " 8– 5–16	35		
8– 5–16 " 8–12–16	74	Depth	.04m
8–12–16 " 8–25–16	81	8–18–16	15.66
8–25–16 " 9–2–16	80		
9–2–16 " 9–9–16	66	Depth	.055m
9–9–16 " 9–16–16	82	9–13–16	21.53
9–16–16 " 9–23–16	25		
9–23–16 " 9–30–16	20		
9–30–16 " 10 1–16	36	Depth	.05m
10–7–16 " 10–14–16	44	10–12–16	19.58
10–14–16 " 10–28–16	6		
10–28–16 " 11–4–16	60	Depth	.07m

TABLE V—*Continued*

Water supplied	No. of hours allowed to flow	Water drawn out	
11–4–16 " 11–11–16	82	11–10–16	27.31
11–11–16 " 11–18–16	48		
11–18–16 " 11–25–16	36		
11–25–16 " 12–3–16	96	Depth	.06m
12–3–16 " 12–9–16	68	12–7–16	23.49
12–9–16 " 12–16–16	24		
12–16–16 " 12–23–16	30		
12–23–16 " 12–30–16	12		
12–30–16 " 1–6–17	36	Depth	.06m
1–6–17 " 1–13–17	60	1–6–17	24.27
1–13–17 " 1–20–17	48		
1–20–17 " 1–27–17	31		
1–27–17 " 2–3–17	60	Depth	05.m
2–3–17 " 2–10–17	48	2–2–17	19.58
2–10–17 " 2–17–17	39		
2–17–17 " 2–24–17	36		
2–24–17 " 3–3–17	39	Depth	.04m
3–3–17 " 3–10–17	48	3–1–17	15.66
3–10–17 " 3–17–17	48		
3–17–17 " 3–24–17	84		
3–24–17 " 3–31–17	48	Depth	.03m
3–31–17 " 4–7–17	72	3–29–17	11.75
4–7–17 " 4–14–17	72		
4–14–17 " 4–21–17	58		
4–21–17 " 4–28–17	84	Depth	.06m
4–28–17 " 5–5–17	60	4–26–17	23.49
5–5–17 " 5–12–17	36		
5–12–17 " 5–19–17	36		
5–19–17 " 5–26–17	24	Depth	.04m
5–26–17 " 6–2–17	72	5–25–17	15.66
6–2–17 " 6–9–17	40		
6–9–17 " 6–16–17	48		
6–16–17 " 6–23–17	24		
6–23–17 " 6–30–17	60	Depth	.06m
6–30–17 " 7–7–17	48	6–30–17	23.49
7–7–17 " 7–14–17	12		
7–14–17 " 7–21–17	18		
7–21–17 " 7–28–17	18		
7–28–17 " 8–4–17	36		
8–4–17 " 8–11–17	48		
8–11–17 " 8–18–17	48		
8–18–17 " 8–25–17	00		
8–25–17 " 9–1–17	00		
9–1–17 " 9–8–17	00		

The drawing out of water from the paddy occurred every time of transplanting. This was to give a fresh supply of water to the newly transplanted seedlings. The volume of water drawn out was calculated from measurements of the depth of water and the dimensions of the field.

Analysis.—The total salt content of the water entering into the paddy was determined once every two weeks and quantitative analysis of the water was also made once. The results of these determinations are shown in Table VI.

Table VI shows that the total residue

from the filtered samples varied from 100 to 200 parts per million and from the unfiltered ones from 140 to 250 parts per million. The average residue from the filtered tests was 148.4 and from the unfiltered was 193.8 parts per million.

TABLE VI

TOTAL SALT CONTENT OF WATER ENTERING INTO THE PADDY.

Date	Total Solid p. p. m.	Volatile Solid p. p. m.	Non-Volatile Solid p. p. m.	Date	Total Solid p. p. m.	Volatile Solid p. p. m.	Non-Volatile Solid p. p. m.
June 19, 1916				Dec. 26, 1916			
Filtered	170	40	130	Filtered	140	40	100
Unfiltered	180	46	134	Unfiltered	180	60	120
July 6, 1916				Jan. 10, 1917			
Filtered	150	20	130	Filtered	140	30	110
Unfiltered	200	50	150	Unfiltered	170	60	110
July 19, 1916				Jan. 28, 1917			
Filtered	180	60	120	Filtered	150	40	110
Unfiltered	250	90	160	Unfiltered	180	70	130
Aug. 2, 1916				Feb. 10, 1917			
Filtered	160	50	110	Filtered	150	50	100
Unfiltered	220	60	160	Unfiltered	190	80	110
Aug. 15, 1916				Feb. 28, 1917			
Filtered	170	40	130	Filtered	140	40	100
Unfiltered	200	60	140	Unfiltered	200	80	120
Aug. 29, 1916				March 10, 1917			
Filtered	200	60	140	Filtered	160	40	120
Unfiltered	230	80	150	Unfiltered	200	70	130
Sept. 14, 1916				March 28, 1917			
Filtered	170	50	120	Filtered	140	30	110
Unfiltered	210	90	120	Unfiltered	180	60	120
Sept. 28, 1916				April 10, 1917			
Filtered	160	40	120	Filtered	140	40	100
Unfiltered	200	60	140	Unfiltered	200	70	130
Oct. 12, 1916				April 28, 1917			
Filtered	100	20	80	Filtered	100	40	60
Unfiltered	186	40	146	Unfiltered	160	80	80
Oct. 27, 1916				May 10, 1917			
Filtered	160	40	120	Filtered	100	20	80
Unfiltered	210	80	130	Unfiltered	140	40	100
Nov. 15, 1916				May 28, 1917			
Filtered	170	50	120	Filtered	160	40	120
Unfiltered	190	60	120	Unfiltered	200	60	140
Nov. 29, 1916				June 10, 1917			
Filtered	160	40	120	Filtered	130	50	80
Unfiltered	190	70	120	Unfiltered	190	70	120
Dec. 12, 1916				June 28, 1917			
Filtered	120	30	90	Filtered	140	40	100
Unfiltered	180	50	130	Unfiltered	210	60	150

The total residue of the filtered sample of which a complete analysis for salt constituents was made, was 158.2 parts per million. This was higher than the average of the other tests made. From the analysis of the residue, silica (SiO) was found highest (37.04%), sulphate second (17.07%), sodium third (10.42%), and lime fourth (10.18%). Magnesia was only 3.35% With regard to volatile constituents, nitrates were present in the amount of 0.416 parts per million, and total ammonia 0.480 parts per million. From this analysis it was found that there was no nitrite.

Temperature of water.—The temperature of water in the paddy was taken daily at 6:00 a.m. and 6:00 p. m. at three different stations and the average of the three readings was considered as the temperature of the water at that time; these values are shown in the third column of Table VII and are plotted in Plate III page 182.

Temperature and atmospheric condition.—The temperature of the air which surrounded the plants was observed by means of wet and dry bulb thermograph. The records were checked by a mercurial thermometer weekly when record sheets were changed. The reading apparatus was put in a case supported 5 feet from the ground on legs; the walls of the case were slatted so that there was a free circulation of air but the roofing was of double layers of wood with a space between. The case was put in the middle of the paddy-field. Plate II, page 181

The air temperatures expressed as mean weekly values, are shown in the second column of Table VII and are plotted as a graph in Plate III, page 182.

TABLE VII

WEATHER RECORDS, 1916-1917.

Period.	Air Temp. in oC mean wkly	Water Temp. in oC mean of 3 stations	Evaporation (a)	Index of insolation (b)	Rainfall
			cc.		cc.
May 26 to 27, 1916	26.0	26.73	155.8	cc.	0
" 27 " June 3, 1916	27.2	26.56	335.7	155.8	0
June 3 to 10, 1916	28.4	26.22	334.1	142.8	121.6
" 10 " 17 "	27.4	24.61	195.4	92.2	414.8
" 17 " 24 "	26.6	25.68	253.5	115.4	102.5
" 24 " July 1, 1916	26.7	27.20	256.2	150.1	199.7
July 1 to 8, 1916	26.4	26.57	201.7	105.1	134.4
" 8 " 15 "	27.1	27.44	285.4	157.9	174.8
" 15 " 22 "	26.2	26.54	213.0	110.0	263.5
" 22 " 29 "	26.8	26.64	279.9	140.0	129.5
„ 29 " Aug. 5, 1916	27.2	26.92	282.3	141.4	125.3
Aug. 5 to 12, 1916	27.7	26.04	294.1	142.5	90.1
" 12 " 19 "	27.7	26.55	245.7	89.6	46.0
" 19 " 26 "	27.4	27.09	261.4	119.4	144.0
" 26 " Sept. 2, 1916	27.0	26.84	174.8	91.0	187.0
Sept. 2 to 9, 1916	27.2	26.69	203.5	78.2	35.0
" 9 " 16, 1916	26.3	25.97	149.0	68.5	321.0
" 16 " 23 "	26.1	25.46	155.0	76.1	332.2
" 23 " 30 "	25.9	25.04	89.9	40.5	574.0
" 30 " Oct. " 7, 1916	27.2	25.93	151.9	84.9	170.0
Oct. 7 to 14, 1916	28.6	25.83	155.4	79.4	118.50
" 14 " 21 "	27.0	25.92	134.9	70.0	511.5
" 21 " 28 "	27.6	26.17	159.8	61.5	336.5
" 28 " Nov. 4, 1916	27.2	25.33	155.0	27.1	279.0
Nov. 4 to 11, 1916	27.0	25.14	189.5	97.4	46.0
" 11 " 18 1916	26.4	25.02	152.2	65.2	67.0
„ 18 " 25 1916	27.2	25.17	107.9	55.5	305.0
„ 25 " Dec. 2, 1916	27.2	26.05	185.0	105.5	55.0
Dec. 3, to 9, 1916	27.1	24.25	117.5	50.0	58.0
" 9 " 16 "	2 .4	24.78	102.1	70.5	126.0
" 16 " 23 "	27.0	25.19	175.5	70.5	69.0
" 23 " 30 "	25.3	23.73	70.3	45.5	398.5
" 30 " Jan. 6, 1917	25.3	24.63	129.3	54.7	252.0
Jan. 6 to 13, 1917	24.4	22.30	152.9	41.7	153.0
" 13 " 20 "	25.2	23.80	175.3	57.0	21.0
" 20 " 27 "	25.0	23.63	109.7	65.5	75.0
" 27 " Feb. 3, 1917	25.2	23.14	142.3	42.2	0
Feb. 3 to 10, 1917	25.1	23.19	194.1	61.5	12.0
" 10 " 17 "	24.0	23.02	208.8	66.7	15.5
" 17 " 24 "	25.1	23.74	234.9	66.5	36.5
" 24 " Mar. 3, 1917	27.4	23.88	275.7	75.5	0
Mar. 3 to 10, 1917	27.9	23.94	258.5	76.5	43.0
" 10 " 17 "	27.0	23.91	265.4	84.5	152.5
" 17 " 24 "	27.2	24.49	278.3	84.5	4.0
" 24 " 31 "	27.7	24.22	258.5	75.5	23.0
" 31 " April 7, 1917	28.8	24.95	332.4	91.4	0
April 7 to 14, 1917	28.4	25.25	300.4	82.5	13.0
" 14 " 21 "	28.1	25.42	315.1	77.2	22.0

TABLE VII—*Continued*

Period.	Air Temp. in oC mean wkly	Water Temp in oC mean of 3 stations	Evaporation (a)	Index of insolation (b)	Rainfall
April 21 to 28, 1917	30.0	25.54	342.6	86.5	0
" 28 " May 5, 1917	29.9	26.59	286.5	83.1	0
May 5 to 12, 1917	28.6	25.95	221.1	57.8	116.0
" 12 " 19 "	29.5	25.76	276.3	61.7	146.0
" 19 " 26 "	28.1	25.20	175.8	48.0	176.0
" 26 " June 2, 1917	28.0	26.03	153.6	51.5	92.0
June 2 to 9, 1917	29.4	26.33	194.9	40.2	82.0
" 9 " 16 "	28.6	26.18	182.2	56.4	247.0
" 16 " 23 "	28.2	25.65	162.4	66.6	279.0
" 23 " 30 "	27.8	25.86	104.7	37.0	170.5
" 30 " July 7, 1917	27.6	25.96	95.8	20.6	74.0
July 7 to 14, 1917	27.3	25.08	72.9	26.0	303.0
" 14 " 21, 1917	27.4	25.25	70.7	33.5	527.0
" 21 " 28 "	27.2	25.71	74.5	31.8	476.0
" 28 " Aug. 4, 1917	28.1	25.75	80.8	18.6	29.0
Aug. 4 to 11, 1917	29.7	25.90	85.8	32.0	44.0
" 11 " 18 "	29.2	26.65	140.4	34.2	18.0
" 18 " 25 "	28.6	26.15	88.2	30.1	58.0
" 25 " Sept. 1, 1917	29.3	26.40	120.0	52.6	33.0
Sept. 1 to 8, 1917	28.2	26.30	91.3	36.0	215.0

(a) Loss in cc. from Livingston standard white spherical porous cup atmometer.
(b) Difference in cc. between loss from standard black spherical atmometer and loss from standard white spherical atmometer.

Evaporation and insolation.—To measure evaporation the Livingston porous cup atmometers were used. (5) Both black and white spherical cups were used. The black porous cups which the writer used in his experiment were prepared from Livingston white porous cups. The white cups were soaked to the neck in Stafford's India ink. Then they were cleaned by boiling them in aqua regia solution for at least 5 hours. The object in boiling in aqua regia was to remove the small particles that clogged the pores of the clay cups. After boiling, they were cleaned with distilled water, care being taken not to touch the evaporating surface of the cup. They were then dried in shade and later standardized in total darkness against a cup with a known coefficient.

The white atmometer was used to record the evaporative power of the air.

The difference in cubic centimeters between the day readings of the black atmometer and the white atmometer (B-W), was used as a measure of insolation. Readings were taken at 6:00 a. m. and 6:00 p. m. every day. The cups were restandardized from time to time. The atmometers were put in the tops of bamboo poles about 1.5 meters above the ground in the paddy-field. They were never shaded. (See Plate II, page 181).

The evaporation and insolation data are presented in Table VII and are plotted as graphs in Plate III, page 182.

Rainfall.---The rainfall was recorded by means of a rain-gauge placed in the middle of the paddy-field. The readings were recorded in cubic centimeters at 6:00 a. m. and 6:00 p. m. every day. (In the style of rain-gauge used, one centimeter of depth is equal to 48 cubic centimeters of water caught.)

The data of rainfall are shown in Table VII and are plotted as a graph in Plate III.

The culture graphs are indicated as culture 1 C-1, C-2, C-3, C-4, C-5, C-6, C-7, C-8, C-9, C-10, C-11, C-12, C-13,

and C-13'. The corresponding values of the different points on the graphs are given in Table IV. It is to be noted that the number of points in each of the graphs indicates the number of measurements or the length of vegetative growth of each of the cultures, since the final measurement was made after the panicles of rice have appeared.

HARVESTING

Method

Harvesting was done when all the grain was ripe. The five measured plants which represent each of the cultures were harvested separate from the remainder of the 100 plants. The spikes were cut just below the spikelets and the straw was cut just above the root system. The harvest both from the measured plants and from the remainder of the 100 plants was dried in the open air. When the spikes had dried, the grain was removed and weighed. The spikes were added to the straw and also weighed.

Yield Data

Table VIII shows the yield data of all the cultures grown from 1916-1917. In Table VIII the interest is centered on the yield of grain rather than on the yield of straw. In line 19 it will be noticed that the computed yield per hectare in each of the cultures ranges from 9.2 cavanes to 72.4 cavanes of unhulled rice (awnless). In these cultures there was no fertilizer applied. The cultures transplanted on May 26, 1916, June 23, 1916, July 2, 1916, August 18, 1916, and April 27, 1917, gave satisfactory yields, while the cultures transplanted during the months of September, October, November, December, 1916, and January, February, March, 1917, gave poor yields.

From the results shown in lines 19 and 17 in Table VIII it is very clear that the weight of straw is approximately proportional to the number of cavanes of unhulled rice produced. An exception to this statement is seen in the case of culture 1; the reason for this will be explained later. It is also to be noted, from lines 5 and 6 in Table VIII, that the better yielding cultures are taller and have longer panicles than the poorer yielding cultures. The length of the panicle and total height of plants are thus good indicators of high or low yields of grain. The relations will be discussed more fully in the pages which follow.

GENERAL DISCUSSION OF GROWTH DATA AS RELATED TO ENVIRONMENTAL CONDITIONS

Period of Vegetative Growth

Graphs C-1 to C-13 show the vegetative growth of Cultures 1 to 13, respectively. The points in the graphs indicate the weeks. Careful examination will show that from C-1 to C-5 there is a decrease in the period of vegetative growth. Cultures 5, 6, 7, 8, 9, 10 and 11 had a shorter vegetative growth period than cultures 1, 2, 3, 4, 12, and 13 The vegetative growth period of cultures 5, 6, 7, 10 and 11 was seven weeks, while that of cultures 8 and 9 was eight weeks. From culture 11 to culture 13, inclusive, there was an increase in the vegetative growth period. Although cultures 8 and 9 do not agree very well with cultures 5, 6, 7, 10 and 11 in the apparent cycle in the duration of growth period still it may be deduced that rice passes through an annual vegetative growth cycle. It is also apparent that the cultures which had short periods of vegetative growth had also small leaf areas and the cultures which had long growing periods had large leaf areas. In the case of rice the writer can conclude therefore that the longer the rice grows the greater the leaf area it has, and vice versa.

TABLE VIII—YIELD DAT A OF RICE GROWN IN FIELD CULTURES

	Culture Number	1	2	3	4	5	6	7	8	9	10	11	12	13	13'
1.	Date Sown	4-14-16	5-12-16	6- 9 16	7- 7 16	8- 4-16	9-1-16	9-29-16	10-27	12 10	12-22	1-19-17	2-16	3 16	3-16-17
2.	Date Transplanted	5-26	6 23	7-21	8 18	9 15	10-13	11-10	12-8	1-5-17	2-2-17	3-2-17	3 30	4 27	4-27
3.	Date Harvested	9-16	9 30	10-28	11 25	12 23	1-20 17	2 1-17	2 24-17	3 24	4-14	5 5-17	6 30	9 1-17	9 8-17
4.	Age from sowing to harvest, days	155	141	141	141	141	141	134	120	104	123	106	134	169	176
5.	Average height of plants from base to top of panicles, cm	140.9	139.3	138.8	92.0	79.7	70.8	72.7	66.7	74.2	90.3	93.4	104.9	99.9	117.0
6.	Ave. lenght of panicles, cm	26.1	26.1	24.6	18.1	17.3	17.7	17.1	16.7	20.7	22.7	22.9	23.9	21.8	22.7
7.	Total No. of plants harvested[a]	85.	92.	94.	95.	92.	94	93	91	93	93	89	90	84	85
8.	Total dry yield of grain, gm	2499.6	2740.4	2508.4	1254.2	552.8	486.2	413.2	354.1	540.3	634.2	660.8	748.4	1013.3	1192.9
9.	Total dry yield of straw, gm	4937.7	4329.2	4231.8	3239.5	1941.3	1605.5	1419.2	1253.1	1535.4	2617.5	2952.0	3098.2	2870.2	3003.5
10.	Mean yield of grain per plant, gm	29.4	29.8	26.7	13.2	6.0	5.2	4.4	3.9	5.8	6.8	7.5	8.3	12.1	14.1
11.	Mean yield of straw per plant, gm	58.1	47.1	45.0	34.1	21.1	17.0	15.2	13.8	16.5	28.1	33.1	33.3	34.0	35.3
	MEASURED PLANT														
12.	Number of plants harvested	5	4	4	4	5	4	4	4	4	4	5	4	5	3
13.	Total dry yield of grain, gm	138.4	112.0	109.2	51.9	31.5	22.4	18.4	12.0	29.2	28.2	36.5	30.7	63.8	44.3
14.	Total dry yield of straw, gm	285.6	157.8	154.1	107.4	101.0	66.0	57.9	52.8	81.0	79.3	144.2	119.5	159.3	133.0
15.	Mean yield of grains per plant, gm	27.7	28.0	27.3	12.9	6.3	5.6	4.6	3.0	7.3	7.0	7.3	7.7	12.7	14.8
16.	Mean yield of straw per plant, gm	57.1	39.7	38.5	26.9	20.2	16.5	14.5	13.2	20.7	19.8	28.8	29.9	31.8	44.4
	GENERAL DATA FOR ENTIRE CULTURE														
17.	Total wt. of straw per culture, gm.	5223.3	4487.0	4385.9	3346.9	2048.3	1671.5	1477.1	1305.9	1616.4	2696.8	3096.2	3217.7	3029.5	3136.5
18.	Total wt. of grain per culture, gm.	2638.0	2852.4	2617.6	1306.1	384.3	513.6	431.6	366.1	569.5	662.4	697.3	779.1	1077.1	1237.2
19.	Yield in Cavanes (grain unhulled) per harvest in each culture	66.9	72.4	66.4	33.0	9.7	13.6	10.9	9.2	14.0	16.4	17.0	19.5	27.3	31.4
20.	Area planted per culture, sq.m	9	9	9	9	9	9	9	9	9	9	9	9	9	9

(a) This number does not include the 5 measured plants.

It has already been mentioned that the graphs of the weekly change in the value of the leaf-product (indicating leaf area) for the vegetative growth periods of each of the cultures, are shown in Fig. 3, and that graphs showing changes in environmental conditions are plotted in the same figure. The uppermost series of graphs C-1, C-2, C-3, etc., represent the change in leaf-product for culture 1, culture 2, etc. These graphs may be compared with one another (1) with regard to length (indicating length of the vegetative growth period), (2) with regard to slope (indicating the rate of growth), and (3) with regard to the magnitude of the maximum value (indicating the maximum leaf-product). A study of the graphs shows that in a general way, at least, these criteria (length, slope, and maximum value) vary in the same way; that is, graphs which are longest also have the steepest slope and reach the highest maximum value. It may be concluded, therefore, that broadly speaking the length of the vegetative growing period, the rate of vegetative growth, and the maximum leaf area are directly proportional to one another, for this variety of rice and for the general conditions of present experiments. To state this conclusion in another way, it appears that environmental conditions that are favorable to a long growing season also induce rapid growth and a large leaf area, while external conditions that shorten the growing period also decrease the rate of growth and limit the production of leaf area.

Comparing the general outline of the graphs of the cultures in Plate III, page 182 with the weather observations it appears that there is no clear relation to rainfall and insolation. But there is an apparent relation existing between the graphs of evaporation, water temperature and air temperature and the graphs of growth.

MAXIMUM LEAF PRODUCT, STRAW AND GRAIN YIELDS AND AGE AT MATURITY.

General.—To know how the different cultures responded to the weather conditions it is necessary to express the results obtained in the most simplified manner. The production of grain and straw appear to sum up nearly the total activity of the plant: but as this production is partly dependent upon the weather conditions, the two should be compared. The maximum leaf product of each of the cultures also shows the character of the plants grown at that period. The results obtained are planned to correlate only with temperature, evaporation, rainfall and insolation.

Each of the climatic factors here considered is expressed in its own unit, as shown in Table VII. Temperature is expressed as the average daily mean temperature [½ (max.—min.)] in degrees centigrade, but these readings are also expressed in its equivalent indices for plant growth in corn seedlings (6). Evaporation is expressed as c. c. of loss from Livingston's standard atmometer; Rainfall is expressed in c. c.; and insolation is also expressed in c. c.

Table IX shows the comparison of yield and weather conditions during each growth period. It is to be noted that 13' means that this culture was grown at the same time as culture 13, which was the last culture grown for the experiment-13' differed from 13 in that for the former the seed used was taken from the harvest of culture 2, while for culture 13 the seed was taken from the same stock used throughout the series, and thus the seed used for culture 13 was a year older than that used for culture 13'.

This tabulation is best presented in graphic form. As shown in Plate IV, page 183, the abscissas of the graphs represent values of the different weather and plant data, and the ordinates show number of culture, date of sowing, date of transplanting, and date of harvesting.

TABLE IX

COMPARISON OF YIELD OF RICE CULTURE TO WEATHER CONDITIONS DURING EACH GROWTH PERIOD.

Cultures	Date of sowing	Date of transplanting	Date harvested	No. of days from sowing to harvest	Total evaporation c. c.	Insolation in c. c.	Summation indice stemp weekly	Rainfall in c. c.	Maximum lf. area in sq. cm.	Total ht. in cm.	Total yield of grain in cavanes per culture	Total yield of straw in grams per culture
1	4–14–16	5–26–16	9–16–16	155	4016.7	1864.0	102.0	2489.2	5072.6	140.9	66.9	5223.3
2	5–12–16	6–23–16	9–30–16	141	3161.9	1471.5	99.7	2756.5	2589.5	139.3	72.4	4487.0
3	6–9–16	7–21–16	10–28–16	141	2785.6	1292.2	100.0	3120.6	2111.8	138.8	66.4	4385.9
4	7–7–16	8–18–16	11–25–16	141	2198.2	1063.9	100.0	3426.7	815.9	92.0	33.0	3346.9
5	8–4–16	9–15–16	12–23–16	141	2047.6	1009.0	100.2	3047.7	362.3	79.7	9.7	2048.3
6	9–1–16	10–13–16	1–20–17	141	2011.2	833.2	96.8	2657.5	348.9	70.8	13.6	1671.5
7	9–29–16	11–10–16	2–10–17	134	1918.1	793.4	93.0	1571.5	244.5	72.7	10.9	1477.1
8	10–27–16	12–8–16	2–24–17	120	1709.2	643.8	88.5	1138.5	297.3	67.7	9.2	1305.9
9	12–10–16	1–5–17	3–24–17	104	2315.9	712.1	92.0	498.5	804.3	74.2	14.0	1616.4
10	12–22–16	2–2–17	4–14–17	123	2567.0	755.0	99.7	309.5	421.8	90.3	16.4	2696.8
11	1–19–17	3–2–17	5–5–17	106	2595.6	737.0	100.0	267.5	687.9	93.0	17.0	3096.2
12	2–16–17	3–30–17	6–30–17	134	3026.0	839.7	102.0	1343.5	1333.5	104.9	19.5	3217.7
13	3–16–17	4–27–17	9–1–17	169	2556.6	781.7	111.0	2859.5	1290.5	99.0	27.3	3029.5
13¹	3–16–17	4–27–17	9–8–17	176	2677.9	817.7	111.0	3074.5	1733.4	117.0	31.4	3136.5

It is to be noted that in the graphs for plant data there are two kinds of lines used; one is solid and the other is dotted. The solid lines indicate that the numerical values of these graphs were the actual figures obtained in the course of the experiment, while in the dotted lines their numerical values were obtained by computations from the yield data of the check grown. Graphs A and A¹ are maximum leaf-product, B and B¹ are straw and C and C¹ are the yields in cavanes of unhulled rice per hectare.

The graphs of evaporation and of the growth of the cultures show that during the periods of low rates of evaporation the growth rate is also low, and with an increased rate of evaporation there is also an increased rate of growth, as shown by the relative height of the points in the graphs. This relationship does not hold true in the details of the slope between points, but appears evident from an inspection of the general trends of the two graphs. Furthermore, in the latter part of the period, from May to August, 1917, the evaporation diminished quite uniformly, while the growth of the rice was not decreased in anything like the same degree.

The most evident features of the graph of maximum leaf product,[1] the yield of straw, and the yield in grain is that they are almost parallel in their curves. But looking at the graphs, it is noticed that in culture 1 the direction of the graphs of grain seems to go opposite the direction of the graphs of maximum leaf product and straw. It is possible that this difference was caused by the storm which occurred when the grain was about to be harvested. The rain was so heavy that it caused the stalks to bend down. This reduced the yield to a certain extent. A detailed discussion of each of the graphs will now be presented.

[1] Maximum leaf product is the highest figure obtained during the vegetative growth period. It is expressed in square centimeters.

Maximum Leaf Product.—To compare the different yield data more completely with the weather observations it is necessary to compare them one by one with the different weather graphs. The graph of maximum leaf product (the solid line) follows the direction of the graphs of insolation and of evaporation more exactly than any of the other weather graphs. From the insolation and evaporation graphs it is evident that the higher the insolation and evaporation the higher leaf-product. This can be found in cultures 1, 2, 3, 12, 13, and 13'; taking the corresponding values, culture 1 leaf product 5072.6 square centimeters, total evaporation 4016.7 cubic centimeters; culture 2 leaf product 2589.5 square centimeters, total evaporation 3161.9 cubic centimeters; culture 3 leaf product 2111.8 square centimeters, total evaporation 2785.6 cubic centimeters; culture 12 leaf product 1333.5 square centimeters, total evaporation 3026.0 cubic centimeters; culture 13 leaf product 1290.4 square centimeters, total evaporation 2586.6 cubic centimeters and Culture 13' leaf product 1733.4 square centimeters, total evaporation 2677.9 cubic centimeters.

Cultures 7 and 8 gave the least maximum leaf product and this was obtained when the evaporation was also least. This shows then that when the evaporation is low, the leaf product is also low. If the graph of the maximum leaf product of all the cultures is compared with the graph of insolation, it is found that it deviates slightly, but the trend of the two graphs agrees. The same comparison is true with regard to evaporation, since insolation and evaporation are nearly parallel. The temperature does not show as close a relation as evaporation, but it shows that during the periods of ordinary temperature the leaf product is highest and during the cooler periods the leaf-product is less. This is illustrated by cultures 1 to 5 and 10 to 13'. This question may arise: What about culture 9? The maximum leaf product in culture 9 is higher than the rest of the cultures not mentioned, that is, cultures 6, 7 and 8. It is believed that, this culture may be disregarded, since, if we follow the general trend of the graph, we notice that at that point it is very extraordinary, and it may be possible that this may be due to an error in the judgment of the maturity of the leaves at that period of measurement. Even though this measurement is included, it is still lower than cultures 1 to 4 and 11 to 13.

The dotted line which is the check of leaf-product shows the same trend as the solid line. (Table X, line 12.)

Straw.—In the case of straw, the total weight per culture is used. In this graph (solid line) it is apparent that, though the projections of the points do not follow exactly the graphs of leaf product, it has the same general direction. Comparing this graph with the weather conditions it shows relationship to total evaporation more than any of the others. What holds true with the leaf product also holds true with the straw. It is still more striking that at the period during which the least evaporation occurred, the corresponding value for straw was also the least and that with the period of highest evaporation was also the period of highest yield of straw. The corresponding values were in culture 1: straw 5223.3 grams, total evaporation 4016.7 cubic centimeters and in culture 8 straw 1305.9 grams and total evaporation was 1799.2 cubic centimeters.

It is well to know before discussing the check for straw (dotted line), how these figures were obtained.

TABLE X.

YIELDS OF RICE CULTURES

1. Culture Number	1	2	3	4	5	6	7	8	9	10	11	12	13	13'
2. Tests, grain in grams	2638.0	2852.4	2617.6	1306.1	384.3	513.6	431.6	366.1	569.5	662.4	697.3	779.1	1077.1	1237.2
3. Checks, grain in grams	1003.1	932.0	919.0	905.4	1894.2	2015.0	853.1	862.6	907.4	925.0	Average—1121.08 gm.			
4. Coefficients for grain	1.11	1.2	1.22	1.24	.59	.56	1.32	1.30	1.24	1.21	1.19	1.16	1.04	
5. Corrected yield, grain	2928.3	3422.4	3193.5	1619.6	226.7	285.6	569.7	575.9	706.1	801.5	829.8	903.8	1121.7	
6. Tests, straw in grams	5223.3	4487.0	4385.9	3346.9	2048.3	1671.5	1477.1	1305.9	1616.4	2696.8	3096.2	3217.7	3029.5	3136.5
7. Checks, straw in grams	4922.1	3800.0	3708.1	3822.4	4720.0	5395.3	1820.0	1902.2	2062.0	2952.2	Average—3570.43 gms.			
8. Coefficients for straw	.72	.94	.96	.93	.76	.60	1.96	1.87	1.73	1.20	1.19	1.18	1.17	
9. Corrected straw, grams	3760.8	4237.8	4210.5	3112.6	1577.2	1002.9	2895.1	2442.0	2796.4	3236.2	3674.5	3796.9	3541.5	
10. Maximum leaf product L x W	5272.6	2589.5	2111.8	815.9	362.3	348.9	244.5	297.3	804.3	421.8	687.9	1333.5	1290.4	1733.4
11. Coefficients (Obtained from wt. of straw)	.72	.94	.96	.93	.76	.60	1.96	1.87	1.73	1.20	1.19	1.18	1.17	
12 Corrected leaf product	3652.3	2431.1	1927.3	758.8	278.9	209.3	479.2	555.9	1391.4	506.2	817.8	1573.5	1509.8	
13. Corrected yield of straw per plot	41.8	44.3	43.2	30.8	16.3	10.2	28.8	25.8	28.6	33.7	39.4	39.3	41.3	
14. Corrected yield of grain in cavans per culture	74.3	86.9	81.1	41.1	5.7	7.3	14.4	14.6	17.7	20.3	21.1	22.9	28.4	
15. Actual yield in cavans per culture	66.9	72.4	66.4	33.0	9.7	13.0	10.9	9.2	14.0	16.4	17.0	19.5	27.3	31.4

It was stated before that all of the plots, except cultures 11 and 12, were replanted at the same time. The object was also explained. Line 7 in Table X shows the total yield of straw of the check. The average yield of straw of all the cultures divided by the yield of straw in each of the cultures in the check, a figure which is termed the coefficient of that culture for that harvest, is obtained. To get the corresponding yield, multiply the coefficient by the actual yield (line 6) for that same culture. The product shown in line 9, Table X, is the figure plotted. If we let C represent average check; C' the yield per culture in the check; and A the actual yield or test, we have the formula $\frac{C}{C'}$=coefficient. Let coefficient equal X, then X × A equals the corrected value which the writer used in the graph. This formula was used in the computation of the corrected yield of grain and of the leaf product. In the leaf product the coefficient of the straw in each of the cultures was used as the coefficient of the maximum leaf product for the corresponding cultures.

Going back to the straw, the corrected value of the straw, as shown by the dotted line, shows that in cultures 1 to 7, inclusive, the corresponding values are lower than the actual result, and in cultures 6 to 13', inclusive, the corresponding values of the check are higher than the actual results.

Grain.—In rice culture the yield of grain is the most important feature. In the writer's experiment the yield is represented by a graph. From the graph it is seen, except in culture 1, that the same relation as found between leaf product and straw obtains. The reason of the low yield of grain in Culture 1 was explained in the first part of this discussion. Were it not for this difference it is very probable that the yield in grain

would have been higher than the next culture. This is indicated in the yield of straw and maximum leaf product, as in culture 1 the yield of straw and maximum leaf product is higher than in culture 2. These facts furnish a basis to assume that yield of grain in culture 1 would be higher than culture 2, had there been no storm. Assuming that this is the case then the direction of the graph of grain is the same as the direction of the graph of straw and of maximum leaf product.

In this graph it is noticed that in cultures 1, 2, 3 and 4 there is a high yield and that they decrease numerically. Again from cultures 9 to 13' the harvest increases numerically. The lowest harvest occurred between culture 4 and culture 9, these are cultures 5, 6, 7 and 8 or cultures grown from August 4 to December 23, 1916; September 1 to January 20, 1917; September 29 to February 10, 1917, and October 27 to February 24, 1917, respectively. Referring to the weather graphs it is found that the higher the production the higher the total evaporation, and the lower the production the lower the evaporation. The two extremes were in culture 2, the yield being 74.4 cavanes of unhulled rice per hectare and the total evaporation during the period was 2161.9 cubic centimeters; and in culture 8, where the yield was 9.2 cavanes and the corresponding total evaporation 1799.2 cubic centimeters. The most striking feature is that cultures planted in the months of August, September, October and November gave low yield and their corresponding value of total evaporation were the lowest throughout the series. It is to be noted that the yield of the cultures started from a high harvest of 74.4 cavanes unhulled rice and decreased gradually to a minimum of 9.2 cavanes, then the cultures began to increase steadily reaching again to a maximum of 26.3 cavanes of unhulled rice per hectare. Similar facts were also found in the case of total evaporation, starting from a high reading of 4016.7 cubic centimeters of total evaporation and decreasing to a minimum of 1799.2 cubic centimeters and then increasing again to a maximum reading of 2586.6 cubic centimeters. The graph of the yield seems to show an annual cycle of high yield, though the latter parts of the harvest did not reach as high as the first, still it seems to show that there is a good period for growing rice profitably. The lowering of the yield in the latter cultures was due to the decrease of the vitality of the seed as mentioned in the first part of this paper. The yield of culture 2 was 72.4 cavanes unhulled rice. In succeeding cultures there was a gradual decrease to culture 8 which gave the low yield 9.2 cavanes. From culture 8 there was an increase, the last culture 13, yielding 27.3 cavanes.

Comparing the corrected value which is shown by the graph (dotted line,) the direction of the graph follows the general direction of the solid line in many of the points. Deviations of the direction of the two graphs are only found in cultures 5 and 6. Though such deviations occurred the discussion of the above paragraph holds true in these cultures, as referred to total evaporation.

As to rainfall the writer does not find any correlations between it and the graph of yield.

The total height of the plants, as compared to the yield (grain), seems to show that the height is correlated with the production. That is, during the first three and the last three cultures the plants were higher than the rest of the thirteen cultures and it follows that the corresponding yields of these cultures were also higher than the yields of the shorter cultures.

Jacobson [7] showed that the length of culm is positively correlated with the yield. In his work, covering a period of five years, from 1909 to 1913, he employed 910 varieties and obtained a coefficient of correlation of $+0.361 \times^{+}_{-} 0.0216$.

TABLE XI

Yield of grain per culture in grams.

Average length of culms of representative sample plants in centimeters	366-466	467-567	568-668	669-769	770-870	871-971	972-1072	1073-1173	1174-1274	1275-1375	1376-1476	1477-1577	1578-1678	1679-1779	1780-1880	1881-1981	1982-2082	2083-2183	2184-2284	2285-2385	2386-2486	2487-2587	2588-2688	2689-2789	2790-2890
66-69	1																								
70-73	1	1																							
74-77			1																						
78-81	1																								
82-85																									
86-89																									
90-93			1	1						1															
94-97																									
98-101								1																	
102-105					1																				
106-109																									
110-113																									
114-117									1																
118-121																									
122-125																									
126-129																									
130-133																									
134-137																									
138-141																							2	1	

Coefficient of correlation $+0.940 \pm 0.0210$

Table XI shows the degree of correlation between length of culms and yield. It is to be borne in mind that the figure for height is the average height of all the culms produced in the representative sample plants and the yield is the harvest frome ach culture.

In Table XI the coefficient of correlation between length of culm and yield is $+0.940 \pm 0.0210$. This degree of correlation in the present study is higher than that of Jacobson's wo k, but the probable error of the coefficient of correlation obtained by him and by the writer agree except in the fourth decimal place.

The fact that Jacobson obtained a lower degree of correlation than was found in the present study may probably be explained by the circumstance that his coefficient referred to many varieties considered collectively and thus constituted a population, while in the work here reported the coefficient refers to a single variety, which is supposed to be a pure strain.

If we compare the graph of the total height of plants with the different weather observations, we will see that it follows very closely in nearly every detail the direction of the graph of evaporation. The graph of total height of the plants also follows very closely the graph of insolation except in one point where there is a slight difference in the direction of the two graphs. From the three graphs compared it may be noted that during the periods of high evapora-

tion and insolation, the total height of the plants is high, and during periods of low evaporation and insolation the total height is low; in other words in this set of cultures, the higher the total evaporation and insolation, the higher the total heights of the plants.

Evaporation is affected by several conditions, as light, wind, humidity, and temperature. Insolation, on the other hand, is affected by only one factor, light; therefore insolation is a measure of the intensity of the light.

Light is an essential condition for photosynthesis. Therefore it is not remarkable that the total height is closely related to evaporation or insolation, for it may be possible that during the period of high insolation conditions were most favorable for the development of the plants.

Age at maturity.—The age at maturity of the different cultures as shown by the graph does not show clear relationship to the graphs of the weather conditions, except the temperature graph. Cultures 7, 8 and 9 were grown at low temperature, but the age of maturity of these cultures was not affected by the average temperature. Cultures 10 and 11, on the other hand, matured quickly, apparently as a result of the low temperature in the early part of their growth period. That is to say the effect of low temperature becomes apparent after a culture interval as shown by the graph. According to Hutchinson and Quantz* cool temperature causes early maturity of barley, rye, and wheat.

CONCLUSIONS

1. Rice seed kept in a closed vessel at an approximately constant temperature of 27.5°C appreciably loses its vitality in one year.

2. Rice has an annual vegetative growth and flowering cycle, as shown in Table IV and its graph, Plate III.

3. The period required for harvest varies in the Inintiw variety from 104 to 174 days.

4. The yield in grain is highest in the cultures 1, 2, 3 which were sown in the months of April, May and June respectively, and then decreases greatly till culture 8, sown in the month of October, and from culture 9 it increases again. This is clearly illustrated in Plate IV and Table IX.

5. There is no definite ratio between the grain and straw; but it is evident that the grain increases in weight as the straw increases, and not the reverse.

6. The maximum growth occurs during the period of the highest total evaporation and the minimum with the smallest total evaporation.

7. The longer the panicle the greater is the yield of grain.

8. The height of the plants is less during the season of low evaporation and greater during the season of high evaporation.

9. There is a correlation shown by these cultures between the yield of grain and the height of plant; the taller the plant the higher its yield.

10. Grain yield is highest during the season of high evaporation and lowest during the season of low evaporation.

11. In this locality, it appears that Inintiw rice when it is planted during the months of May, June and July gives good returns both in straw and grain; but when planted during the months of November and December, it does not give so good a yield.

12. The longer the period required for reaching maturity the greater is the leaf-product produced.

13. Low temperature during the first month of growth seems to induce early maturity of rice.

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*Hutchinson, T. B., and Quantz, K. E. The effect of greenhouse temperature on the growth of cereals (Journal. American Society of Agronomy, 9: 17-21. 1919).

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EXPLANATION OF GRAPHS

Plate II is a map of the paddy field showing the location of the apparatus used and arrangement of planting.

Legend:

(A) First location of Livingston porous cup atmometers.

(A^1) Second location of Livingston porous cup atmometers.

(A^2) Third location of Livingston porous cup atmometers.

(A^3) Fourth location of Livingston porous cup atmometers.

(1) Station for recording water temperature.

(2) Station for recording water temperature.

(3) Station for recording water temperature.

(4) House for recording apparatus.

(5) Rain gauge.

(6) Water gauge (entrance).

(7) Water gauge (drainage).

O Measured plants.

. Test plants.

× Border plants.

Note:

The arrangement used in Plot 1 (Inintiw Culture 1) was followed in all the successive plots.

Plate I.

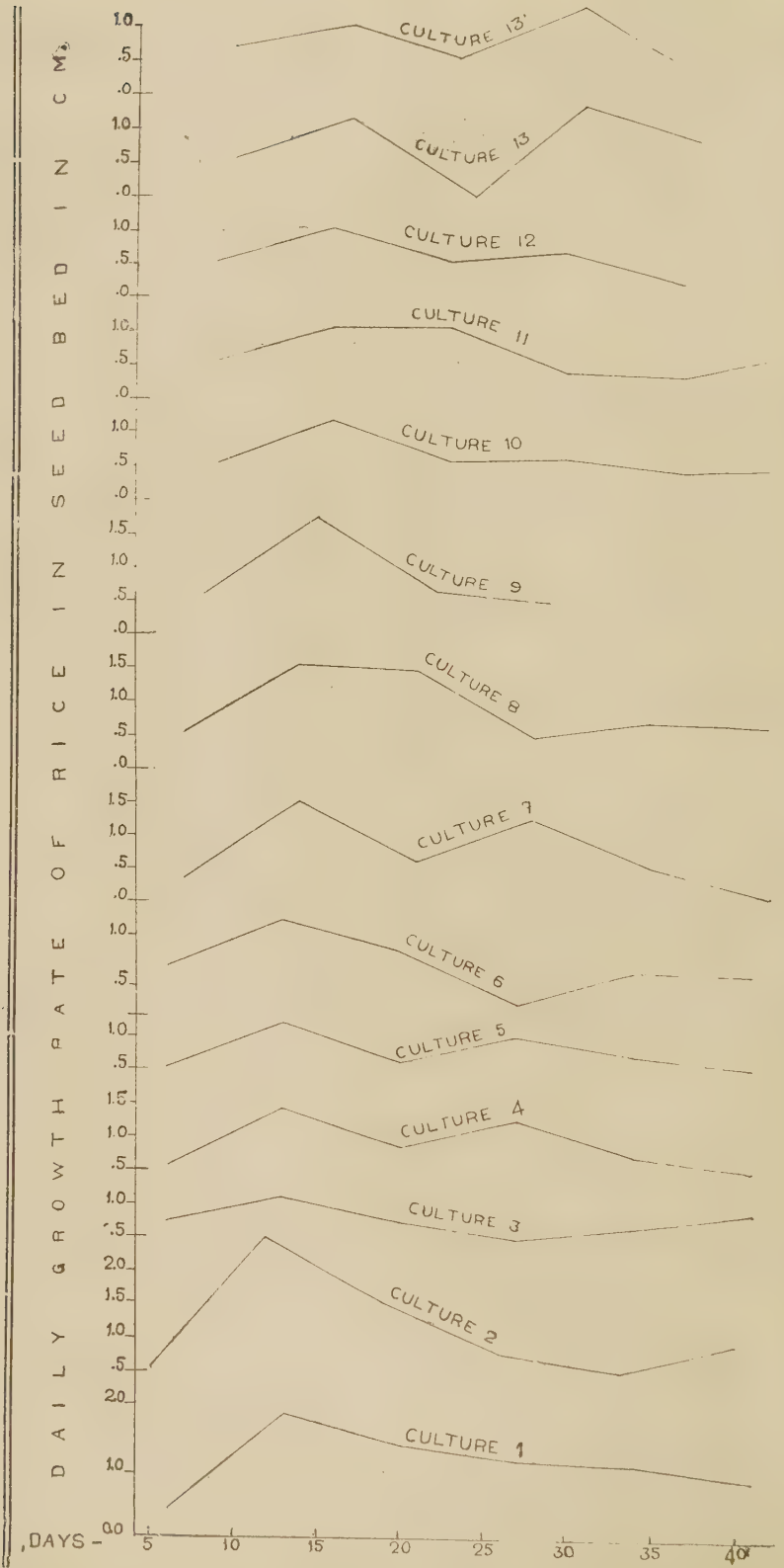

DAILY GROWTH RATE OF RICE IN SEED BED IN CMS.
CULTURE 13'
CULTURE 13
CULTURE 12
CULTURE 11
CULTURE 10
CULTURE 9
CULTURE 8
CULTURE 7
CULTURE 6
CULTURE 5
CULTURE 4
CULTURE 3
CULTURE 2
CULTURE 1
DAYS
5
10
15
20
25
30
35
40

Plate II.

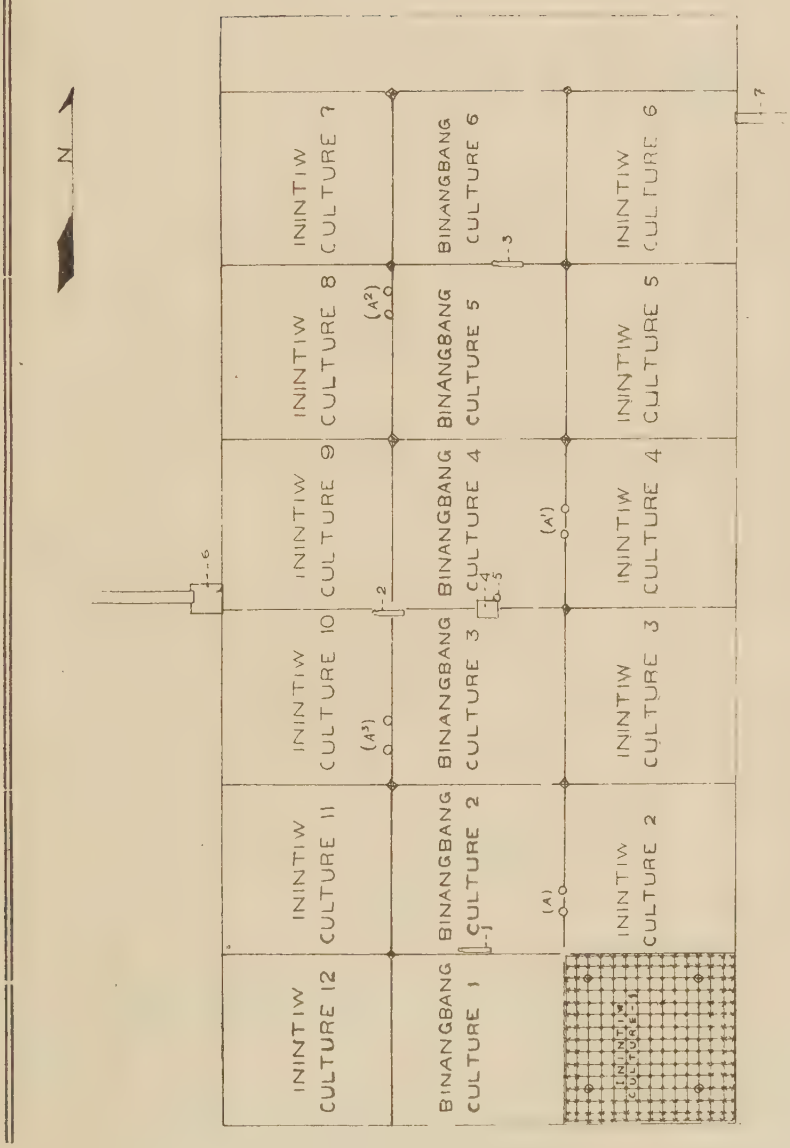

N
ININTIW CULTURE 12
ININTIW CULTURE 11
ININTIW CULTURE 10
ININTIW CULTURE 9
ININTIW CULTURE 8
ININTIW CULTURE 7
BINANGBANG CULTURE 1
BINANGBANG CULTURE 2
BINANGBANG CULTURE 3
BINANGBANG CULTURE 4
BINANGBANG CULTURE 5
BINANGBANG CULTURE 6
ININTIW CULTURE 2
ININTIW CULTURE 3
ININTIW CULTURE 4
ININTIW CULTURE 5
ININTIW CULTURE 6
(A)
(A1)
(A2)
(A3)
1-1
1-2
1-3
1-4
1-5
1-6
1-7

Plate III.

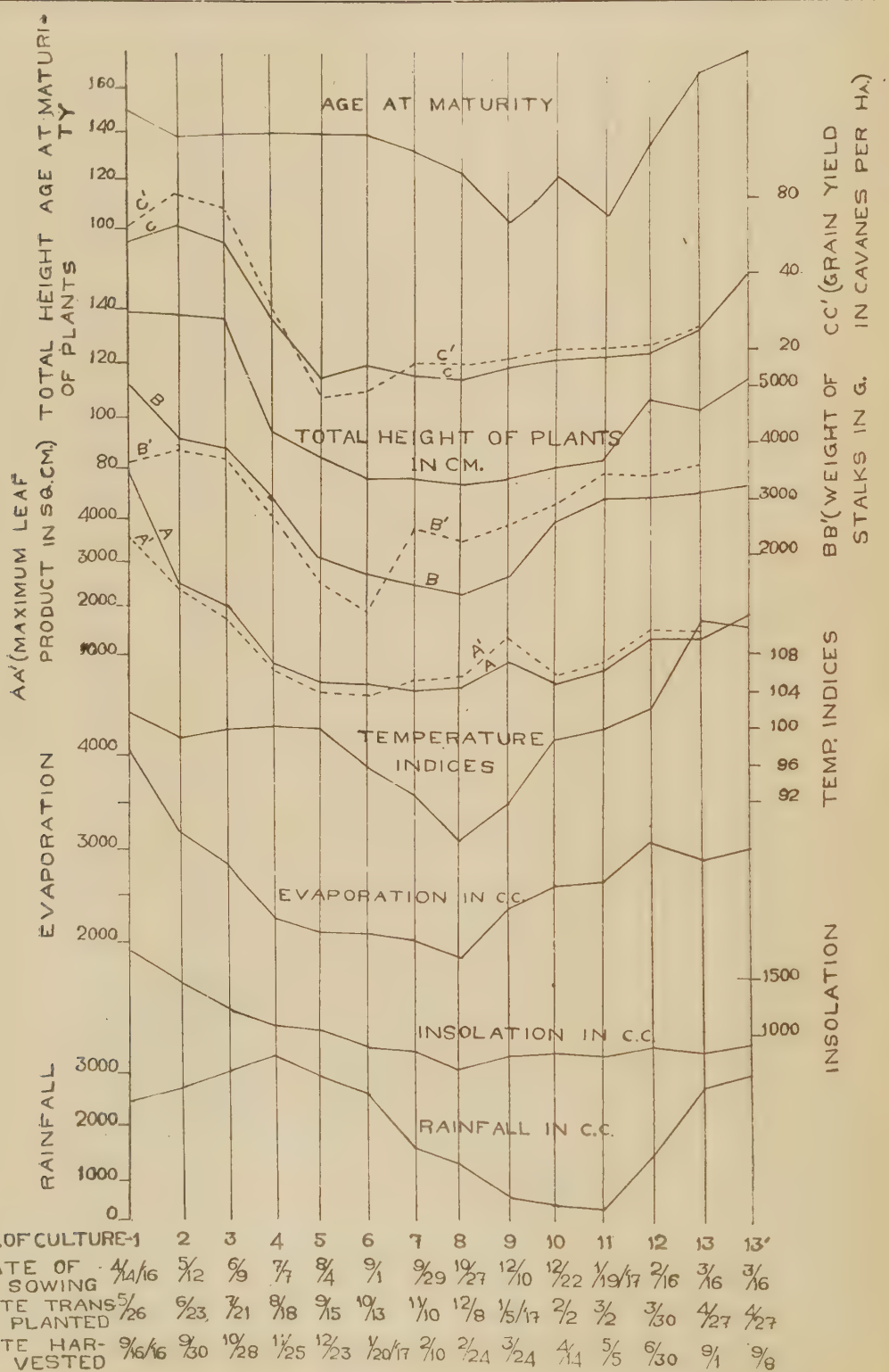
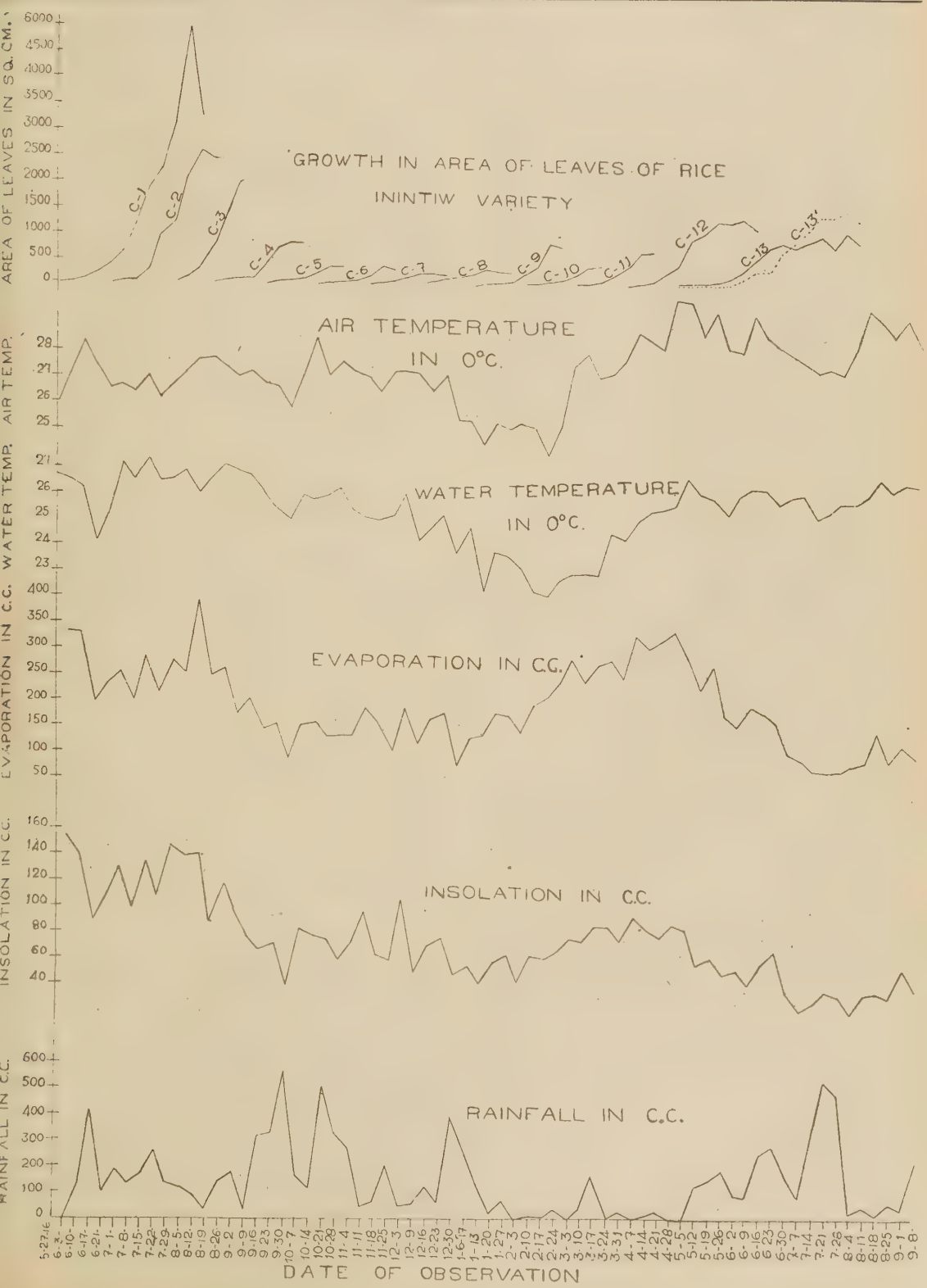

AA'(MAXIMUM LEAF PRODUCT IN SQ.CM.) TOTAL HEIGHT AGE AT MATURITY OF PLANTS
BB'(WEIGHT OF STALKS IN G. CC'(GRAIN YIELD IN CAVANES PER HA.)
AGE AT MATURITY
TOTAL HEIGHT OF PLANTS IN CM.
TEMPERATURE INDICES
EVAPORATION IN C.C.
INSOLATION IN C.C.
RAINFALL IN C.C.
EVAPORATION
TEMP. INDICES
INSOLATION
RAINFALL
NO. OF CULTURE-1 2 3 4 5 6 7 8 9 10 11 12 13 13'
DATE OF SOWING 4/14/16 5/12 6/9 7/7 8/4 9/1 9/29 10/27 12/10 12/22 1/19/17 2/16 3/16 3/16
DATE TRANSPLANTED 5/26 6/23 7/21 8/18 9/15 10/13 11/10 12/8 1/5/17 2/2 3/2 3/30 4/27 4/27
DATE HARVESTED 9/16/16 9/30 10/28 1/25 12/23 1/20/17 2/10 2/24 3/24 4/14 5/5 6/30 9/1 9/8

Plate IV.


AREA OF LEAVES IN SQ.CM.
6000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
GROWTH IN AREA OF LEAVES OF RICE
ININTIW VARIETY
C-1
C-2
C-3
C-4
C-5
C-6
C-7
C-8
C-9
C-10
C-11
C-12
C-13
C-13'
AIR TEMP.
28
27
26
25
AIR TEMPERATURE
IN 0°C.
WATER TEMP.
27
26
25
24
23
WATER TEMPERATURE
IN 0°C.
EVAPORATION IN C.C.
400
350
300
250
200
150
100
50
EVAPORATION IN C.C.
INSOLATION IN C.C.
160
140
120
100
80
60
40
INSOLATION IN C.C.
RAINFALL IN C.C.
600
500
400
300
200
100
0
RAINFALL IN C.C.
5-27-16
6-3-
6-10-
6-17-
6-24-
7-1-
7-8-
7-15-
7-22-
7-29-
8-5-
8-12-
8-19-
8-26-
9-2
9-9-
9-16-
9-23-
9-30-
10-7
10-14-
10-21-
10-28-
11-4
11-11-
11-18-
11-25-
12-3-
12-9-
12-16-
12-23-
12-30-
1-6-17
1-13-
1-20-
1-27-
2-3-
2-10-
2-17-
2-24-
3-3-
3-10-
3-17-
3-24-
3-31-
4-7-
4-14-
4-21-
4-28-
5-5-
5-12-
5-19-
5-26-
6-2-
6-9-
6-16-
6-23-
6-30-
7-7-
7-14-
7-21-
7-28-
8-4-
8-11-
8-18-
8-25-
9-1-
9-8-
DATE OF OBSERVATION

COLLEGE AND ALUMNI NOTES

By a vote of the University Council, intermediate-school graduates of the public schools of the Philippines securing a minimum final grade of 75% in the English subjects and 75% in arithmetic may be admitted to the preparatory course of the College of Agriculture, beginning with the college year 1919-1920. Applicants should request the principals of their respective schools to send to the Registrar of the College B. E. Form 137 on or before May 15, 1919.

The Agronomy Seminar conducted by the Department of Agronomy of this College has been a success. In the last three meetings the following officials addressed the members: Mr. Jose G. Sanvictores, Assistant Director of Agriculture, on "Your Future Will Be as You Will It" (January 8); Dr. W. H. Weston, Plant Pathologist of the United States Department of Agriculture, on "The International Aspects of Plant Diseases" (January 15); Father José Algue, Director of the Weather Bureau, on "Climatology in its Relation to Agriculture" (January 24). Dr. Nemesio B. Mendiola, a graduate of Cornell University, also spoke on the "Inheritance of Acquired Characters," in an earlier meeting.

The College of Agriculture was given authority by the Board of Regents to sell or butcher animals for purposes of instruction.

Professor B. M. Gonzalez, Alumnus Member of the Board of Regents, has been appointed member of the standing committee of the Board for the College of Medicine and Surgery and the College of Agriculture, to succeed Secretary Galicano Apacible.

Professor Joseph A. Cocannouer, formerly connected with the Department of Agronomy of this College, who had been granted extended leave of absence in the early part of 1918, was recently dropped from the Faculty by a vote of the Board of Regents, effective July 17, 1918.

Mr. Pedro Clariza, Assistant in Mathematics of this College, has been transferred from teacher's to accrued-leave basis.

Miss Hazel Kenward, A.B., '13, University of Washington, formerly a teacher at Oakland High School in California has been appointed in the Experiment Station of this College with the rank of Assistant Professor.

Mr. Simon A. Reyes, Plant Inspector of the Bureau of Agriculture, has been transferred from his former station to Iloilo, Iloilo. The following transfers have also been made: Mr. Arsenio A. Goco, Plant Inspector, to Cebu, Cebu; Mr. Felix B. Sarao, Deputy Governor of the Department of Mindanao and Sulu, to Bukidnon, Mountain Province.

About fifteen students of the College of Agriculture who enlisted last October were, on their request, given honorable discharge from active service in the Philippine National Guard. Practically all of them bear certificates of excellent service performed while on duty at Camp Claudio.

Mr. Domingo B. Paguirigan, supervising agent of the Bureau of Internal Revenue, was a recent visitor to the College of Agriculture for consultation with the Dean and the staff of the Department of Agronomy on the question of tobacco.

Mr. Ezequel Alcasid, '19, has been taken into the employ of the Bureau of Agriculture as assistant in the Division of Animal Husbandry.

Mr. Nicanor G. Teodoro, '15, Fiber Inspector, and Mr. Eladio Sablan, '14, Scientific Assistant, of the Bureau of Agriculture, were recently at this College for the purpose of securing two agricultural graduates for fiber work in the Bureau.

Construction on an annex to the Chemistry Laboratory Building is now under way and is expected to be finished shortly.

A new macadamized road is being built to provide a more direct route from the College farm to the Campus.

Mr. James R. Gillis, Assistant Professor of Forestry in the School of Forestry, and Mrs. Charlotte Gillis, Instructor in English of this College, have been granted an extended leave of absence with permission to visit the United States, effective January 25.

The Legislature voted the sum of ₱80,000 to the College of Agriculture for the construction of two additional laboratory buildings, one to house the Department of Entomology and Plant Pathology, and the other, the Department of Chemistry.

Hon. Teodoro R. Yangco, resident commissioner of the Philippines at Washington, recently sent to the College of Agriculture a large consignment of 1916 and 1917 Yearbooks of the United States Department of Agriculture for distribution.

A nipa house belonging to students of this College, and located in the Coconut Grove, was demolished by fire on the 29th of January.

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Success - - - - - - - - -	3.25	,,	,,

PHILIPPINE EDUCATION COMPANY, Inc.

34 ESCOLTA, MANILA.

Weather Observations, December, 1917

OBSERVER: V. RAVARA

	Rainfall in mm.		Temperature in oC				Wind in Miles		Cloudiness	Atmometer Reading in c. c. Evaporation		Insolation	
	Daily	Weekly	Max.	Min.	Mean Daily	Weekly	Daily	Weekly		Daily	Weekly	Daily	Weekly
Dec.													
1	.0		28.0	22.7	25.3		22.7		Clear	16.63		13.6	
2	.0		28.6	23.6	26.1		17.7		Clear	13.45		9.6	
3	.0		28.4	23.5	26.0		31.3		partly cloudy	17.10		9.7	
4	6.7		25.2	23.4	24.3		27.8		Cloudy	7.89		5.9	
5	2.4		26.8	22.8	24.8		29.2		¾ cloudy	8.36		6.7	
6	4.4		26.5	23.0	24.7		26.2		cloudy	8.55		4.4	
7	1.7	15.2	26.8	22.9	24.9	25.2	43.6	198.5	cloudy	12.87	84.85	8.0	57.9
8	3.6		25.8	23.1	24.4		65.1		cloudy	20.49		3.9	
9	23.9		24.6	22.5	23.6		27.7		cloudy	3.85		3.9	
10	0.1		27.9	23.1	25.5		27.3		cloudy	13.63		8.7	
11	.0		27.3	23.7	25.5		29.3		½cloudy	15.13		7.5	
12	.0		27.4	23.1	25.2		27.1		¾cloudy	16.07		7.1	
13	.0		27.8	23.4	25.6		22.3		¾cloudy	14.47		8.5	
14	.0	27.6	28.2	23.0	25.6	25.1	29.4	228.2	½cloudy	17.20	100.84	9.2	48.8
15	.0		27.4	23.4	25.4		32.4		cloudy	17.29		5.7	
16	4.0		25.2	22.9	24.0		30.6		cloudy	7.23		2.1	
17	16.9		26.2	23.0	24.6		21.0		cloudy	7.33		5.3	
18	.0		27.2	22.8	25.0		40.3		cloudy	17.39		5.3	
19	30.0		24.0	23.0	23.5		26.0		cloudy	6.20		.5	
20	24.1		26.0	22.7	24.3		41.7		cloudy	12.03		5.4	
21	2.1	77.1	26.8	23.2	25.0	24.5	14.5	206.5	Partly cloudy	11.28	78.75	5.3	29.6
22	.0		27.0	22.7	24.9		27.2		½ cloudy	12.59		7.0	
23	1.5		26.0	22.9	24.4		21.3		Cloudy	10.34		4.7	
24	0.6		26.7	22.9	24.8		33.5		Clear	15.32		5.7	
25	0.2		25.6	23.2	24.4		50.6		Cloudy	16.26		5.7	
26	0.5		24.1	22.2	23.1		36.6		cloudy	11.09		1.5	
27	.0		24.1	22.0	23.1		53.1		cloudy	15.51		1.9	
28	T	2.8	23.5	21.0	22.2	23.8	67.9	290.2	cloudy	12.40	93.51	6.3	32.8
29	.0		24.9	21.6	23.3		45.4		cloudy	15.04		2.4	
30	.0		24.0	21.8	22.9		54.1		cloudy	17.29		2.0	
31	T		23.8	21.2	22.5		59.7		cloudy	16.16		1.4	
Month		122.7				24.5		1082.6			406.44		174.9

COLLEGE COFFEE PLANTATION

1–8	65.3	26.9	20.1	23.5
8–15	51.1	27.8	18.6	23.2
15–22	65.0	27.5	20.1	23.8
22.29	85.6	25.9	20.4	23.1

SUMMIT OF MOUNT MAQUILING

1–8	63.0	19.9	18.7	19.3
8–15	63.0	21.1	18.3	19.1
15–22	25.0	17.7	17.2	17.5
22–29	95.0	17.1	15.9	16.5

The rainfall, evaporation and cloudiness during the month, were quite uniform and about normal. There were no high winds. Conditions for crop growth were in general quite favorable.

FORMAN T. MCLEAN
Associate Professor of Plant Physiology.

Weather Observations, January, 1918

	Rainfall in mm. Daily	Weekly	Temperature in oC Max.	Min.	Mean Daily	Weekly	Wind in Miles Daily	Weekly	Cloudiness	Atmometer Reading in c. c. Evaporation Daily	Weekly	Insolation Daily	Weekly
29	.0		24.9	21.6	23.2	45.4			cloudy	15.0		2.4	
30	.0		24.0	21.8	22.9	54.1			cloudy	17.3		2.0	
31	T		23.8	21 2	22.5	59.7			cloudy	16.2		1.4	
Jan.													
1	.0		25.9	21.7	23.8	52.0			cloudy	20.5		4.2	
2	.0		26.6	22.7	24.7	55.7			¾cloudy	19.2		6.1	
3	.0		24.6	22.0	23.3	42.7			partly cloudy	17.8		3.2	
4	.5	0.5	24.4	21.8	23.1	23.3	50.0	359.6	cloudy	12.9	118.9	2.8	22.1
5	1.4		24.8	21.6	23.2		55.4		cloudy	14.5		3.1	
6	T		24.0	22.9	23.4		61.4		cloudy	18.8		1.8	
7	.0		23.8	21.2	22.5		61.2		cloudy	21.5		4.0	
8	1.0		22.6	20.8	21.7		101.6		cloudy	18.4		2.2	
9	.8		22.0	19.8	20.9		84.1		cloudy	21.1		2.2	
10	T		23.2	19.5	21.4		76.5		cloudy	22.2		2.2	
11	.0	3.2	24.0	21.2	22.6	22.3	47.3	487.5	cloudy	17.1	133.6	2.9	18.4
12	2.8		23.9	21.8	22.8		20.8		cloudy	5.5		3.7	
13	11.8		22.8	21.8	22.3		17.6		cloudy	2.5		1.1	
14	2.2		24.8	21.6	23.2		57.3		cloudy	16.2		2.4	
15	.3		23.9	21.6	22.7		86.8		cloudy	20.2		2.8	
16	.0		23.2	21.4	22.3		82.3		½cloudy	19.1		2.5	
17	T		23.9	20.0	22.0		57.7		cloudy	23.0		3.2	
18	.0	17.1	24.4	21.2	22.8	22.6	55.3	377.8	¾cloudy	19.6	103.1	2.2	17.9
19	.0		25.8	21.9	23.8		64.5		cloudy	20.2		2.7	
20	.0		25.9	22.2	24.1		60.4		cloudy	27.2		2.2	
21	.0		23.7	21.5	22.6		88.3		cloudy	27.3		1.4	
22	.0		23.3	21.0	22.1		60.5		½cloudy	21.3		2.3	
23	.0		23.9	20.8	22.4		70.5		cloudy	25.7		1.5	
24	.1		24.0	21.4	22.7		46.5		¾cloudy	17.3		2.1	
25	.0	0.1	23.8	21.7	22.7	22.9	84.0	474.7	cloudy	23.0	162.0	0.9	13.1
26	.0		22.9	20.4	21.7		125.5		cloudy	23.8		2.3	
27	.0		23.3	20.8	22.0		69.8		cloudy	20.4		1.2	
28	.0		23.8	20.5	22.1		69.6		cloudy	24.0		.6	
29	.0		24.3	20.9	22.6		84.0		¾cloudy	27.0		1.7	
30	.0		25.1	21.1	23.1		49.1		½cloudy	21.7		3.4	
31	T	0	24.0	21.0	22.5	22.3	72.4	470.4	cloudy	17.9	134.8	2.3	11.5
Month		20.9				22.7		2010.8			606.9		77.2

Dec.	College Coffee Plantation			
29–5	7.4	24.1	18.5	21.3
5–15	9.0	23.8	18.1	20.9
12–19	44.0	22.6	17.2	19.9
19–26	22.0	23.4	16.9	17.1
26–2	1.6	22.9	17.0	19.9

	Summit of Mount Maquiling			
29–5	14.0	17.1	15.9	16.5
5–12	25.0	15.3	13.6	15.0
12–19	22.0	17.4	16.8	17.1
19–26	72.0	16.4	15.7	16.0
26–2	25.0	15.3	14.4	14.9

The month was markedly dry, there being only one effective rain, on January 12 to 14. In spite of this, the month was also cold, cloudy, and windy, and decidedly unfavorable.

Forman T. McLean
Associate Professor of Plant Physiology.

Weather Observations, February, 1918

Observer—V. Ravara

	Rainfall in mm.		Temperature in oC					Wind in Miles		Cloudiness	Atmometer Reading in c. c.			
	Daily	Weekly	Max.	Min.	Mean Daily		Weekly	Daily	Weekly		Evaporation Daily	Evaporation Weekly	Insolation Daily	Insolation Weekly
26	.0		22.9	20.4	21.7		125.5			cloudy	23.8		2.3	
27	.0		23.3	20.8	22.0		69.8			cloudy	20.4		1.2	
28	.0		23.8	20.5	22.2		69.6			cloudy	24.0		.6	
29	.0		24.3	20.9	22.6		84.0			¾ dloudy	23.8		2.3	
30	.0		25.1	21.1	23.1		49.1			½ cloudy	21.7		3.4	
31	T		24.0	21.0	22.5		72.4			cloudy	17.9		2.3	
Feb.														
1	.0	.0	23.8	21.5	22.6	22.4	102.7	573.1		cloudy	21.7	156.5	3.9	15.4
2	.0		26.1	21.8	24.0		84.0			¾ cloudy	23.5		3.1	
3	1.1		26.1	22.2	24.1		52.8			cloudy	18.4		4.0	
4	.5		26.8	22.6	24.7		34.2			¾ cloudy	17.6		4.6	
5	.5		26.8	21.0	23.9		13.5			½ cloudy	16.4		6.9	
6	.0		28.2	21.6	24.9		43.1			½ cloudy	26.7		5.5	
7	T		25.9	21.7	23.8		73.1			½ cloudy	28.0		5.6	
8	.0	2.1	24.8	20.6	22.7	24.0	73.8	374.5		cloudy	31.0	133.6	5.4	35.
9	T		22.7	20.4	21.5		47.8			cloudy	13.6		.8	
10	.0		23.9	22.0	23.0		46.7			cloudy	20.3		2.4	
11	.0		23.5	21.0	22.2		68.8			cloudy	22.1		1.1	
12	2.0		23.1	22.0	22.6		62.2			cloudy	13.2		1.6	
13	1.0		25.7	21.7	23.7		57.0			¾ cloudy	16.5		3.0	
14	.0		28.0	21.6	24.8		52.1			clear	32.7		3.9	
15	.4	3.4	28.5	21.4	24.9	23.1	24.5	359.1		½ cloudy	29.8	148.2	5.4	18.2
16	1.2		24.9	24.0	24.5		57.5			cloudy	31.6		1.6	
17	.0		24.4	21.6	23.0		81.4			cloudy	24.0		2.4	
18	.0		22.8	20.7	21.7		68.5			cloudy	23.5		3.6	
19	.0		22.0	20.2	21.1		93.6			cloudy	25.1		3.2	
20	.0		23.6	19.5	21.6		106.9			cloudy	30.4		4.0	
21	.0		25.7	19.8	22.7		73.0			cloudy	32.9		5.5	
22	1.2	2.4	23.6	19.7	21.7	22.3	47.6	528.5		cloudy	21.0	188.5	4.2	28.1
23	.0		24.6	20.6	22.6		72.4			clear	34.3		4.1	
24	T		24.0	18.6	21.3		70.4			clear	27.3		4.2	
25	T		23.9	21.2	22.5		54.1			½ cloudy	20.7		1.4	
26	5.9		26.6	21.6	24.1		61.5			cloudy	19.4		4.3	
27	.3		28.2	21.9	25.1		54.7			clear	33.5		6.4	
28	.0	6.2	27.4	21.7	24.5	23.3	63.6	376.7		clear	36.8	172.0	5.6	26.0
Month		14.1				23.2		1741.5				664.0		111.3

Jan. College Coffee Plantation

26–2	2.2	23.4	16.9	20.1
2–9	13.5	27.9	17.2	22.5
9–16	11.2	28.0	18.0	23.0
16–23	10.3	23.9	16.2	20.5
23–2	2.7	27.5	16.1	26.8

Summit of Mount Maquiling

26–2	10.0	15.3	14.4	14.9
2–9	25.0	17.0	15.3	16.2
9–16	19.0	16.5	14.7	15.6
16–23	80.0	15.8	14.8	15.2
23–2	8.0	15.2	14.1	14.6

This month, like January, was dry, there being no effective rains. It was also cold, windy, but not as cloudy as January, the evaporation and insolation being thus appreciably higher. This was again an unfavorable month for all moisture-demanding crops.

Forman T. McLean,
Associate Professor
of Plant Physiology.

Weather Observations, November 1918

Observer—R. P. Estioko.

	Rainfall in mm. Daily	Weekly	Temperature in oC Mean Max.	Min.	Daily	Weekly	Wind in Miles Daily	Weekly	Cloudiness	Atmometer Reading in c. c. Evaporation Daily	Weekly	Insolation Daily	Weekly
1	13.6		28.2	23.6	26.9		71.1		½ cloudy				
2	3.1	16.7	27.4	23.4	25.4	26.1	34.2	432.5	½ cloudy				
3			29.0	23.6	26.3		86.8		¾ cloudy				
4	2.2		28.0	22.6	25.3		59.7		¾ cloudy				
5	1.4		28.6	23.4	26.0		53.8		½ cloudy				
6	1.3		29.4	23.8	26.6		73.8		¾ cloudy				
7	1.3		28.5	23.6	26.0		65.7		¾ cloudy				
8	11.5		29.2	23.1	26.1		76.7		¾ cloudy				
9	1.7	19.4	28.5	22.6	25.5	25.7	66.6	483.1	½ cloudy				
10	2.3		27.5	23.2	25.3		60.9		¾ cloudy				
11	4.9		28.2	22.6	25.4		41.8		cloudy				
12	7.1		26.2	23.1	24.6		97.9		½ cloudy				
13	3.8		29.0	23.8	26.4		104.5		¾ cloudy				
14	5.8		28.8	23.4	26.1		75.4		clear				
15	7.0		26.5	23.1	24.8		54.4		fair				
16	1.0	29.6	27.5	23.0	25.2	25.4	70.3	510.23	¾ cloudy				
17	0		27.0	23.4	25.2		57.3		½ cloudy				
18	0		27.8	22.4	25.1		72.3		½ cloudy				
19	3.6		27.5	21.8	24.6		48.5		½ cloudy				
20	0		27.8	21.6	24.7		48.6		½ cloudy				
21	0		28.5	22.1	25.3		59.3		clear				
22	0		28.5	22.6	25.5		36.7		½ cloudy				
23	1.8	5.4	28.8	23.4	26.1	25.4	19.2	320.3	½ cloudy				
24	0		28.5	22.6	25.5		46.5		¾ cloudy				
25	0		28.5	22.6	25.5		29.3		¾ cloudy				
26	0		29.5	22.6	26.0		21.5		½ cloudy				
27	0		28.8	22.6	25.7		30.6		½ cloudy				
28	0		29.5	22.6	26.0		62.2		clear				
29	1.6		26.5	23.4	24.9		32.1		cloudy				
30	0	1.6	28.0	23.1	25.5	25.6	72.9	295.1	clear				
Month		75.0				25.6		1735.6					

Records of atmometer readings were omitted during this month because instruments were in bad order.

Oct.	College Coffee Plantation			
27–3	48.5	29.5	21.6	25.5
3–10	32.3	29.2	20.0	24.6
10–17	43.6	27.0	20.8	23.9
17–24	3.5	28.5	19.8	24.1
24–Dec. 1	3.2	28.8	20.0	24.4

Oct.	Summit of Mount Maquiling			
27–3	52.6	20.0	18.8	19.4
3–10	22.1	20.4	19.2	19.8
10–17	29.2	19.0	18.0	18.5
17–24	3.8	20.6	18.8	19.7
24–Dec. 1	4.2			20.4

Oct.	450 Meters Elevation Mt. Maquiling
27–3	43.7
3–10	24.5
10–17	42.8
17–24	5.1
24–Dec. 1	3 6

The month was unusually dry throughout, and quite windy, but cloudy. The effect on vegetation was not injurious, except that late rice was badly in need of water at the end of the month.

Forman T. McLean
Associate Professor of Plant Physiology.

Weather Observations, December, 1918

OBSERVER—R. ESTIOKO.

Rainfall in mm. Daily	Rainfall in mm. Weekly	Temperature in oC Max.	Temperature in oC Mean Min.	Temperature in oC Mean Daily	Temperature in oC Mean Weekly	Wind in Miles Daily	Wind in Miles Weekly	Cloudiness	Atmometer Reading in c. c. Evaporation Daily	Atmometer Reading in c. c. Evaporation Weekly	Atmometer Reading in c. c. Insolation Daily	Atmometer Reading in c. c. Insolation Weekly
Dec.												
1 .0		28.5	22.8	25.6	25.1	68.9						clear
2 0		28.2	22.8	25.5		29.6						clear
3 0		27.8	23.2	25.5		99.5						cloudy
4 0		27.0	22.4	24.7		85.7						cloudy
5 0		26.0	23.0	24.5		95.8						cloudy
6 0		27.5	22.8	25.1		99.4						clear
7 0	0	28.0	21.5	24.7	25.1	80.7	559.6	½				cloudy
8 0		27.0	22.5	24.7		65.5						cloudy
9 0		27.4	22.0	24.7		70.8		½				cloudy
10 2.1		28.0	22.2	25.1		62.0		¾				cloudy
11 0		28.0	22.0	25.0		59.4		½				cloudy
12 0		28.0	22.8	25.4		95.3		¾				cloudy
13 15.2		26.8	23.2	25.0		9.2						cloudy
14 8.3	25.6	27.5	22.8	25.1	25.0	60.7	422.9					cloudy
15 0		28.8	23.5	26.1		80.3						clear
16 0		28.0	22.0	25.0		61.5						clear
17 0		27.8	22.0	24.9		72.3		½				cloudy
18 2.1		27.5	23.0	25.2		72.6						cloudy
19 0		28.0	22.8	25.4		66.4		½				cloudy
20 0		28.0	22.0	25.0		63.4		¾				cloudy
21 0	2.1	27.8	23.2	25.5	25.3	58.8	475.3					cloudy
22 0		27.2	21.5	24.3		44.5		¾				cloudy
23 0		27.2	21.4	24.3		40.5						clear
24 0		26.8	18.8	22.8		27.9		½				cloudy
25 4.2		27.5	21.8	24.6		153.2						cloudy
26 54.8		26.5	23.5	25.0		109.6						cloudy
27 T		26.0	22.5	24.2		63.6		½				cloudy
28 6.4	65.4	26.5	23.0	24.7	24.3	17.0	456.3	½				cloudy
29 1.3		27.5	24.0	25.7		31.4		¾				cloudy
30 0		27.0	23.2	25.1		75.0		½				cloudy
31 6.2		27.2	22.8	25.0		46.9		½				cloudy
	93.1				25.0		2067.4					

COLLEGE COFFEE PLANTATION

2–8	6.7	28.6	19.0	23.8
9–15	17.8	29.0	20.4	24.7
16–22	10.3	27.5	19.0	23.3
23–29	78.2	27.8	20.8	24.3

SUMMIT OF MT. MAQUILING

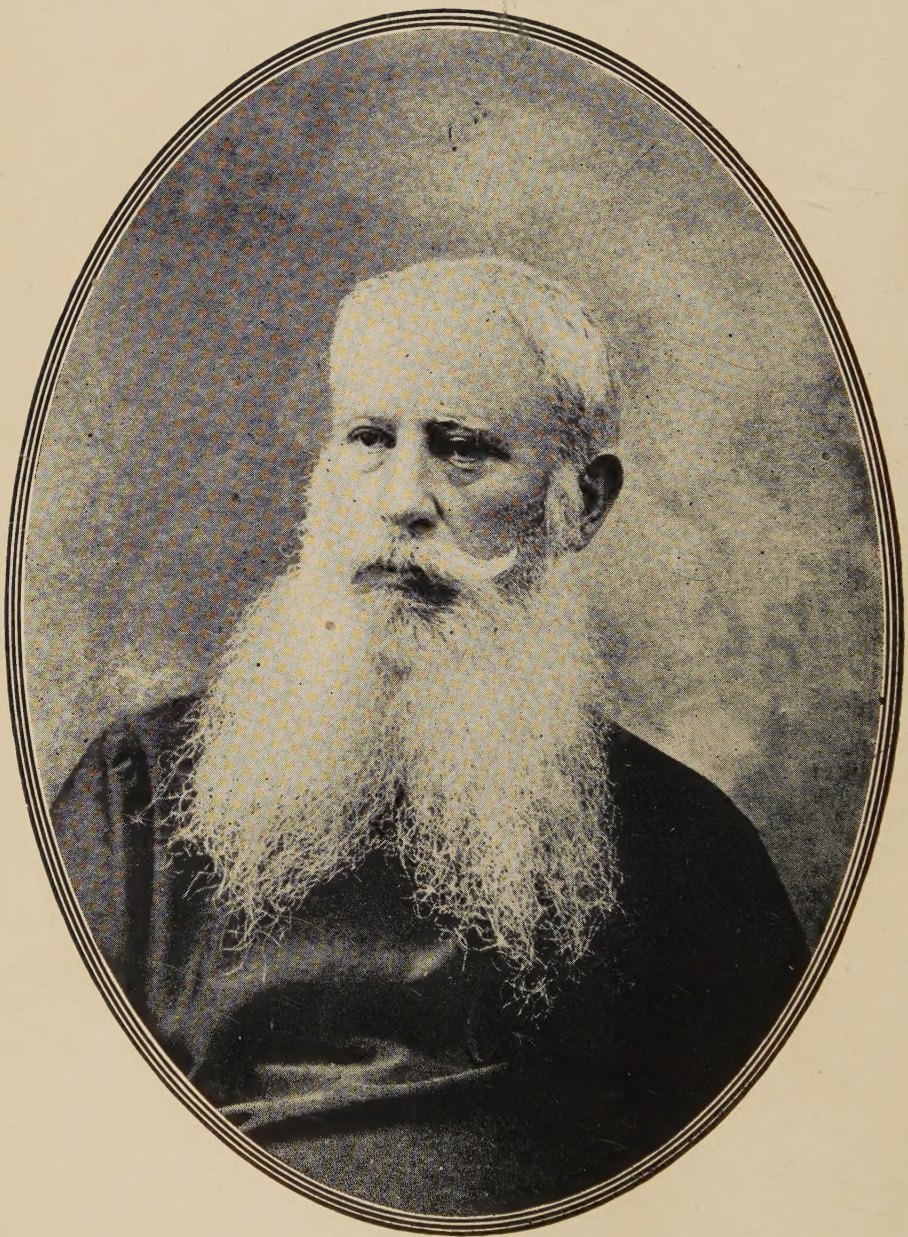
2–8	4.9	18.1	17.1	17.6
9–15	15.5	18.7	17.2	17.9
16–22	4.3	17.9	16.6	17.3
23–29	30.5	19.1	17.1	18.1

450 M. ELEVATION MT. MAQUILING

2–8	5.5
9–15	19.2
16–22	2.4
23–29	82.0

The month was cloudy, windy, and dry. The only beneficial rains, on December 13 and 14, and after Christmas, were barely sufficient to relieve the drouth.

FORMAN T. MCLEAN
Associate Professor of Plant Physiology.



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